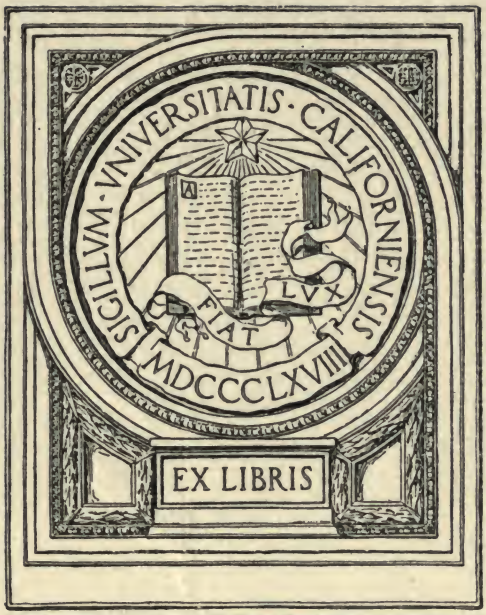
CLEVELAND FOUNDATION SURVEY OF EDUCATION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THE BUILDING TRADES

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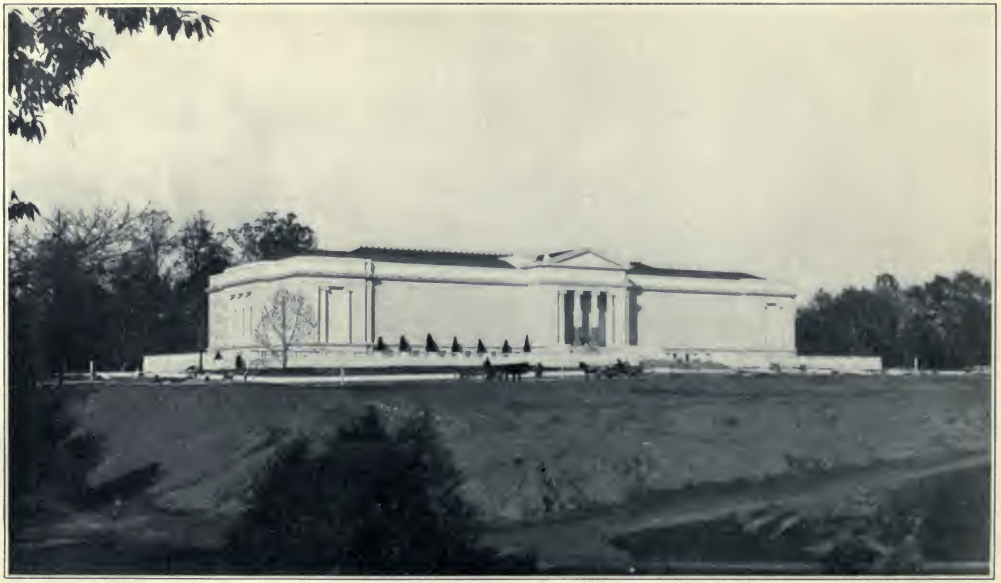

Art Museum after 29 months' work, October 22, 1915. Progressive stages in the construction are shown in the other illustrations

CLEVELAND EDUCATION SURVEY

THE BUILDING TRADES

BY

FRANK L. SHAW

THE SURVEY COMMITTEE OF THE
CLEVELAND FOUNDATION
CLEVELAND · OHIO

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FOREWORD

This report on "The Building Trades" is one of the 25 sections of the report of the Education Survey of Cleveland conducted by the Survey Committee of the Cleveland Foundation in 1915. Twenty-three of these sections will be published as separate monographs. In addition there will be a larger volume giving a summary of the findings and recommendations relating to the regular work of the public schools, and a second similar volume giving the summary of those sections relating to industrial education. Copies of all these publications may be obtained from the Cleveland Foundation. They may also be obtained from the Division of Education of the Russell Sage Foundation, New York City. A complete list will be found in the back of this volume, together with prices.

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THE BUILDING TRADES

CHAPTER I

NATURE OF BUILDING WORK

There has been rapid progress in the art of building since the days when our pioneer forefathers built crude log-cabins to shelter themselves against the severity of American winters. The homes of the colonists were naturally constructed of timber because of the abundance of native woods; and so the frame house speedily developed in this country. The brick form of building, most common in the England of those days, was not extensively copied here because of the scarcity of skilled labor. The European house usually had brick walls supporting its floors and roof, but the frame house that came into vogue in America was supported by its frame of heavy timbers. The walls were fastened on afterwards. In course of time, with the invention of modern methods of sawing, these frames were built less heavy, until at length the modern frame construction as we know it was introduced. These newer buildings were less wasteful of lumber than the earlier ones, and this was an item that had to be considered, for even in

the early days heavy timber rapidly became less abundant as the population increased and spread.

Variety and Value of Building

The steel skyscraper is characteristically American. Cities grew up with amazing rapidity, involving a consequent rise in the price of land. The invention of modern machinery and the coincidental rise of the factory system had not a little to do with this urban movement. And so a form of construction had to be discovered or devised which would house more people on a smaller land area. That meant taller buildings. This demand came earliest and most insistently in New York City, where the narrow confines of the island of Manhattan enclosed a larger population in a smaller area than was the case anywhere else in America. As a result buildings of ever increasing height were constructed until the city had what were then regarded as skyscrapers as much as eight stories high. But experience showed that in order to have sufficient strength brick and masonry buildings of this height required such immensely thick walls that but little light entered through the windows of the lowest stories. As a result America developed modern steel-frame buildings in which the walls of stone or brick are supported by the metal beams instead of themselves being the support of the rest of the building. Today the erection of wooden buildings within certain limits is strictly forbidden in all large cities, so urgent is the

public insistence on fireproof construction. In part, this popular demand has been met by the use of concrete reinforced with steel rods, not only for the frame work, but often for the walls, floors, and partitions as well.

Although it is true that in Cleveland more wooden frame buildings than any other kind are erected today, the amount of money spent for buildings made of brick, tile, steel, or cement is greater. Also there is an increasing tendency, year by year, to use these fireproof materials. The report of the Division of Buildings clearly shows this steady tendency during the last 25 years. Diagram 1, on page 14, is based on the annual reports of the Department of Public Safety of the City of Cleveland for 1890, 1900, 1910, and 1914, and shows the relative amounts spent for new buildings of wood and of fireproof materials. It is interesting to note that during this period total building operations increased in cost from $4,327,405 to $23,595,960. In 1890 about four per cent of the new permits issued were for brick buildings; in 1900 this proportion had increased to nearly nine per cent, and in 1914 to 20 per cent. Take another standard of comparison. In 1890 brick construction represented 32 per cent of the total value of the new buildings erected that year; in 1900 this had increased to 50 per cent and in 1914 to 62 per cent.

In other words, a quarter of a century ago brick construction comprised less than one-third of all building work; today it comprises almost two-thirds. It should be noted that the term "brick,"

as used in these city reports, refers to all construction that is not of wood. It should be added that wood is being displaced not only as the principal material used in frames and other heavier parts of building, but also in the making of interior fittings such as moldings and sash.

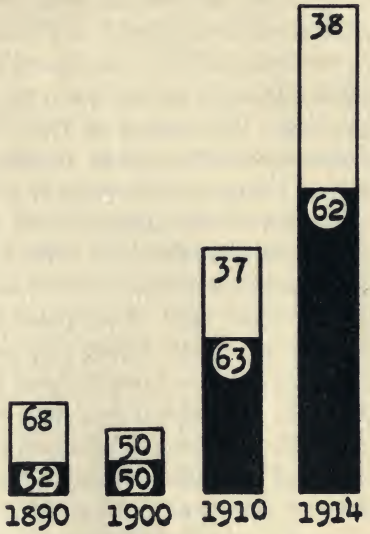


Diagram 1.—Relative cost of buildings erected in Cleveland in 1890, 1900, 1910, and 1914. Black sections show percentage spent for brick construction and outline sections percentage spent for wood

To bring out more clearly the variety and value of buildings being erected in Cleveland, Table 1 is presented. This is a statistical abstract of building operations for 1914, as reported by the Division of

Buildings, and is typical of the distribution in recent years.

TABLE 1.—ABSTRACT OF BUILDING OPERATIONS IN CLEVELAND, 1914

Kind of building	Number	Value
Frame dwelling	2,630	$8,262,910
Brick apartment	325	4,306,000
Manufacturing	88	3,008,150
Public	4	2,128,000
Alteration of brick dwelling	388	1,299,400
Store	109	1,237,100
Alteration of frame dwelling	2,051	959,785
Minor alterations	6,020	836,975
Office	13	824,900
Storage	56	785,300
Assembly	26	676,000
School	5	560,000
Frame apartment	96	511,900
Brick dwelling	64	453,700
Detention	2	375,000
Foundations	241	313,750
Miscellaneous	630	298,930
Moving picture	15	222,000
Hotel	2	125,000
Theatre	2	120,000
Billboard	23	4,210
Total	12,790	$27,309,010

It will be observed that nearly one-third of the money spent in 1914 for all building purposes was spent for common frame dwellings. The large proportion of this type of building still being erected, in spite of the very considerable increase in the number of brick and masonry structures built during the past quarter century, will not escape notice. Attention should be directed to the place brick apartment houses occupy in the building operations of the city, and to the large amount of money that is spent for alterations and additions to buildings.

The erection of any modern building is a very complex operation, involving the employment of anywhere from 10 to 20 different groups of workers. Some of these men will be common laborers, whose only asset is their strength; others will need to be not only naturally intelligent, but also trained in the technical knowledge of their specialty.

Contractors

Most people are more or less familiar with the way a common frame dwelling is built. First, an architect is consulted who makes sketches, draws plans, and writes out the specifications. These are submitted to contractors for competitive bids. The lowest bidder usually gets the contract, which he may, and often does, sublet to several others.

The contractor's estimates are based on careful computations of costs and availability. Failure to complete a job within a stipulated period frequently means that he must forfeit a good share of his profit. A man may know all there is to know about the theory of building, he may be an expert manager of men, but if he cannot figure probable costs he cannot hope to succeed. The open doors of the bankruptcy courts await the incompetent estimator. It is next to impossible for the journeyman, in the course of his daily work, to learn much about reckoning building costs. He ought to be able to get this valuable training somewhere if he is looking forward to establishing an independent business.

Laborers

After the exact location of the building has been determined, common laborers begin to excavate for cellar and foundation. These men are not masters of any trade. They must be able to understand simple English and to do what they are told. Throughout the construction of the building they will carry lumber and other materials needed by the skilled men.

Bricklayers

After the excavation is completed, the bricklayers begin to build the foundation walls. They are the first skilled men to work on the house. The stability of the whole structure is determined by its foundation, which, in the case of a frame house, will be carried to about two feet above grade. If the house is to be of wood, the bricklayers will have little more to do than build the chimneys. If it is to be of brick, they must continue putting up the walls. In brick dwelling houses the inside walls are usually built with ordinary brick, while the outside walls are made of face brick of various shades; sometimes the substantial support is an iron or wooden frame veneered by a thin brick wall.

Besides making the walls strong, bricklayers have to make them attractive. They accomplish both these objects by bonding, which is laying brick in such a way that they will hold together the outside and inside layers of the wall. This is done by laying occasional bricks, called "headers," with ends

towards the outside, so that they reach back and tie the inside wall to the front. A regular design is followed and bricks of a different hue are often used as "headers" to render more conspicuous the regularity of the bond and thus enhance its beauty.

The work of these bricklayers is not uninterrupted. When they have built the wall to the bottom of a door or window they must either stop until the carpenter sets the frames in place, or else work on another part of the wall. After the frames are set they will then brick around them. As they proceed with their work they must also provide places for floor joists, and other supporting timbers, which they will build around as soon as the carpenters put them in place. These joists, as well as the plates which support the rafters, are often anchored to the masonry construction by wrought-iron rods.

Carpenters

In a frame house carpenters take up the work as soon as the bricklayers have finished the foundation. They place the sills and erect the studs or posts to which the walls and partitions will be fastened. They place the joists, stringers, ledges, and rafters, and erect the frame. They construct the roof and put on the interior and exterior finish, build entrances and porches and set doors and window frames. Everything must be accurately measured, squarely cut, properly set, and firmly fastened.

Few carpenters are versatile enough to do all these

Excavating for foundation of new Art Museum. Appearance after two months' work, July 23, 1913

things. A man usually specializes in some particular branch of carpentry. This is particularly true of interior trimming, floor laying, and stair-building. In addition, there are ship carpenters, railroad carpenters, bridge carpenters, car builders, etc. Indeed, so wide is the range of building operations which the trade covers that the United Brotherhood of Carpenters and Joiners has found it necessary to publish a book of explicit definitions called "The Book of Jurisdictional Claims." Many of the other trades publish similar manuals.

The skill of the carpenter may be said to increase as he adds to the number of tools in his kit, or as he assumes supervision of the work of others. If his job is to build forms for concrete construction, he will need only a hammer, saw, and rule; if he is engaged in putting on interior trim, he may need a whole chest of tools. The more tools he can use the more likely is he to become an independent worker, not relying on a foreman for instruction. This means that he must increase his technical knowledge, for if he is to lay out work he has to be able to read plans and to understand simple geometrical forms and operations.

Painters

By the time the carpenters have placed the inside trim, the painters probably have finished the exterior of the house, and are ready to begin on the interior. This requires greater skill and in all probability will not be done by the same men. Interior painting offers

a wide range of work. The surfaces to be painted have to be more carefully prepared than for exterior painting and the work itself offers greater opportunities for the exercise of artistic sense. Sometimes the trim is not painted but is finished by staining, varnishing, waxing, frescoing, or graining. Besides painting or finishing the interior trim, painters are often called on to decorate the plaster walls and ceilings. Formerly, paperhanging was done by the painters, but it is now coming to be recognized as a separate trade. Wood finishing is a special branch of the painter's trade.

Plumbers

The present emphasis on public health and the rapid rise of the science of sanitation have added importance to the plumbing trade. A first-class plumber today requires as much technical training as any skilled worker in industry. He must understand the principles that govern the circulation and pressure of water, and the construction and operation of siphons, tanks, filters, etc. In gas-fitting he needs to know the nature of gases and the methods of distributing them. He has to be able to read blueprints, and must be handy in the use of the tools of his trade. He is the only man engaged in building work who is obliged to have a city license in Cleveland. Examinations have to be passed by the journeyman and the master plumber. The latter must also give bond.

Plumbers begin their part of the work on the house by laying the supply pipes connecting with the city

water, and the waste and sewer pipes connecting with the street sewer. Later on they set in place the wash-bowls, bath-tubs, and toilets. The precise details of their work are not defined for them in the specifications, as they are for practically all other workers. They have more latitude for the exercise of experience and judgment. They have to be prepared to meet unexpected emergencies with tested knowledge. This is even more important in repair work than in original work.

Steam-fitters

Large buildings are ordinarily heated by steam. Formerly plumbers installed the plant and system; today steam-fitting is a separate trade. In order to dry the building and get it ready for occupation, radiators are placed as soon as possible. The mechanical work of the steam-fitter is similar to that of a plumber. Plumbing and steam-fitting are so much alike that to avoid jurisdictional disputes the unions by agreement have closely defined the kinds of work each trade may undertake.

Inside Wiremen

Today most dwelling houses and practically all office buildings are wired for electricity. The system is installed by an electrician or inside wireman whose job is to extend metal tubes throughout the house for the wires to which the lighting, heating, vacuum cleaning, and other electrical fixtures are later at-

tached. A wireman must be able to read blueprints in order to determine the exact location for tubes. He must also have some technical knowledge of the simple elements of electricity and magnetism so that he will understand conductors, insulators, circuits, currents, connections, and systems of distribution.

Lathers and Plasterers

Stucco houses are very popular today. As soon as the carpenters are done with the rough outside boarding of an ordinary frame house, lathers may begin to put on wood or metal laths. Then comes the plasterer with his trowel and float to apply the cement. It is much the same with interior lathing and plastering, which can be started as soon as the plumber and electrician have finished. Two or three coats are usually applied. Decorative or ornamental plastering requires some technical knowledge and much skill. An allied trade is that of the cement finisher, whose work consists of laying and smoothing cement floors, sidewalks, etc.

Sheet Metal Workers

The modern tinsmith, now called a sheet metal worker, puts on the tin or iron roof; or else the strips of tin, zinc, or copper around the chimneys and in the valleys, if the roof is shingled. He makes and puts in place the gutters and spouts. He builds and sets the skylights, the metal sash, fire doors, and

molding. A good deal of this work is done in the shop and then later set in place. Intricate joints can not be made by rule of thumb methods. Ability to read and work with blueprint drawings is essential.

Structural Iron Workers

The earthquake of San Francisco shocked not only the city by the sea, but the civilized world. When the convulsions subsided and the fires died out, our attention was called to the striking fact that the huge fireproof, steel-frame buildings remained erect and defiant. Many weeks are often spent far below the street level, laying the foundations for these great buildings, used for hotels, department stores, offices, and apartments. Meanwhile the steel rolling mills have been making the frame for the lower stories, each beam and brace carefully marked for its exact place. Then the structural iron worker begins to erect the steel frame to which the walls and finish are fastened. The outer walls are usually of stone or terra cotta, although they may be built of brick or concrete. The interior partitions are usually constructed of fire brick. Wood is being displaced by metal for everything—even furniture. The occupation of the structural iron worker is never lacking in thrills. It calls for daring and steady nerves and the sort of skill that enables one to walk around, assembling and bolting parts, on the narrow beams of the tenth story of a rising skyscraper. The ornamental iron worker also is primarily an assembler.

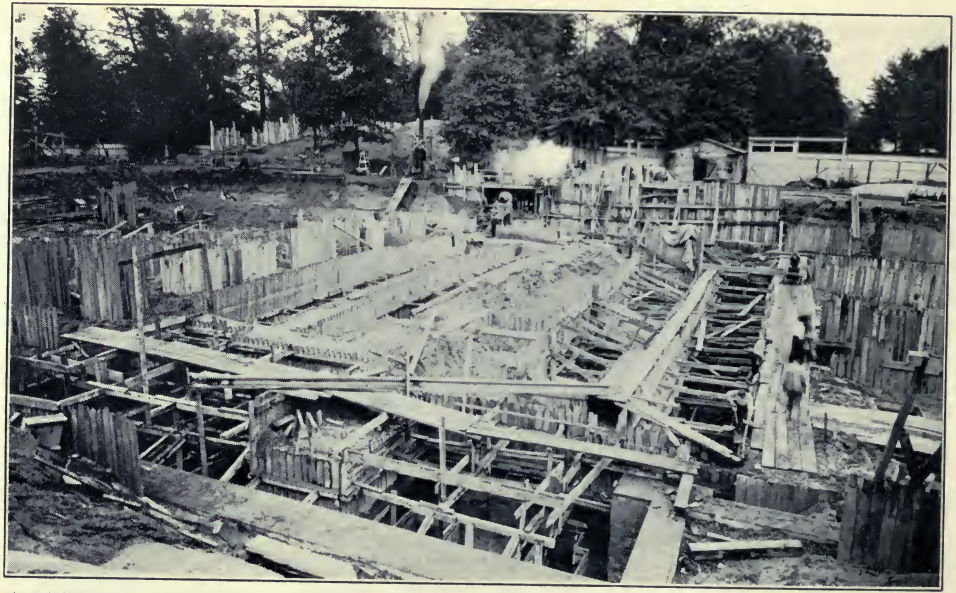
His work consists of the erection of stairways, balustrades, elevator enclosures, balconies, iron window guards, fancy gates, and so on.

Hoisting Engineers

The erection of such buildings as we have just described would be next to impossible without the help of the heavy boom derrick and the hoisting engineer. By means of these derricks, operated with steam engines, brick, mortar, and the iron parts may be carried to any quarter of the various floors. The stationary engineer must exercise great care in responding immediately to signals. In Cleveland he is exempted from the usual examination required of other steam engineers, but in many of the other large cities of the country hoisting engineers are obliged to hold licenses.

Other Trades

Besides the building trades that have been mentioned, there are several others that are important although not engaging the services of such large numbers of workers. Among these are stone masons, marble setters, and tile layers. The work in these trades is closely allied to bricklaying. Stone cutting, formerly important, is fast becoming a machine operating trade. Cabinet-making, machine woodworking, constructing elevators, laying slate, tile and composition roofs, and placing asbestos also engage other groups of special workers.



Art Museum after four months' work, September 18, 1913. Part of foundation has been built

Repair Work

A considerable proportion of building work is connected with the alteration and repair of old buildings. This was brought out in Table 1 on page 15. Repairing is so important a part of the work of the men in some trades that the outsider is apt to think of them only as repairmen and to fail to connect them with new construction. This is particularly true of the plumbing trade. Besides this kind of repair work, which is distributed generally throughout the trades, large manufacturing concerns also employ regularly during the year a considerable number of carpenters, bricklayers, steam-fitters, and painters to keep their plants in repair.

Changing Character of the Work

Much of the skilled labor of today is mere assembling. We have left behind us the age of individual craftsmanship, when all artisans exercised the creative faculty throughout every phase of production. And now we are rapidly moving away from a time when all factories really manufacture. Many automobile factories, for example, buy the parts of their cars from outside concerns. Their own work is limited to assembling the various parts. The same trend is increasingly evident in the building industry. Much of the shaping of materials, formerly done by carpenters on the job, is now done on machines in the mill. This change is particularly noticeable with respect to interior work, where the trim is all shaped

and cut to size, so that when it reaches the job the carpenter has only to fasten it in place. Lathing, hardwood floor laying, structural iron work, and to a considerable degree, plumbing, steam-fitting, and electrical wiring are assembling trades. The same tendency in the division of labor is noticeable in the other building trades.

Several factors influence and determine the various changes in the character of the work in the building trades, as in all others—among them the introduction of new materials, new processes, and new machines. This has been called an age of concrete. Cement is now used in place of wood for many purposes. Instead of causing a reduction in the demand for carpenters, as might be expected, this has, quite on the contrary, accelerated construction and increased the demand. It has, however, lowered the general standard of the carpenter's trade. Twenty years ago all carpenters needed a complete knowledge of framing, and also ability to do interior work; today a considerable proportion are employed on form work in concrete construction, where strength and moderate skill in the use of hammer, saw, and rule are all that is required.

Specialization, through the increased use of machinery, is responsible for changed conditions in the cabinet-maker's trade. Formerly all cabinet-making was done by hand; now most of the parts are made by machine woodworkers, while the cabinet-makers, or bench hands, as they are called today, simply assemble and fasten them together. Much the same

thing is true of the sheet metal worker, the plumber, and the steam-fitter. Due to these changes a good deal of the work that was rich in interest and called for considerable skill two decades ago has now become monotonous and mechanical.

Summary

1. In colonial times and in the days of the pioneers, practically all structures were built of wood.

2. The rapid increase in population, and the tendency to settle in cities, called for tall buildings in order to house more people on less area. This necessitated the substitution of steel and concrete for wood in their construction to make them fireproof.

3. In 25 years, from 1890 to 1914, new building operations in Cleveland increased in cost from $4,327,405 to $23,595,960. Two-thirds of the former amount, but only one-third of the latter, was for buildings of wood construction.

4. One-third of the total amount spent for all building operations in 1914 was for frame dwellings and one-ninth for alterations and repairs.

5. The erection of most modern buildings is a very complex operation, involving the employment of from 10 to 20 different groups of workers.

6. In an earlier age, the artisan made an article from start to finish. Such craftsmanship is now practically extinct. Today a great deal of the work in connection with building is not done on the job, but is performed in factories. As a result of this,

much of the skilled labor in building has become mere assembling. This trend is increasingly evident.

7. New materials, new processes, and new machines are among the factors that influence and determine the various changes in the character of the work. Due to these changes, many trades that formerly were rich in interest and called for considerable skill have now become monotonous and mechanical.

CHAPTER II

NUMBER IN THE TRADES AND SOURCES OF SUPPLY

Wherever civilized people live, they build dwellings to house themselves, and wherever they engage in manufacture and commerce, they must have factories, office buildings, and stores. As a result, the proportion of men engaged in building in different cities is about the same. This means that if a boy learns any of the building trades he can find work anywhere in the country; that is, his field of employment is not limited to a restricted territory, as is the case in highly localized occupations. There are local trades, just as there are local customs. One of the printing trades is a case in point. Lithographic poster artists are found in few cities of the country outside of Cleveland, where one-third of all the men employed in this trade are located.

Number in the Trades

A careful estimate places the number of men engaged in building in Cleveland at the present time at about 30,000, comprising more than one-fifth of the total

in manufacturing and mechanical occupations. Building ranks next to the metal industries in number employed. Table 2 shows an estimate of the number in the various trades in 1915. This table is based on the United States Census figures for 1900 and 1910 and the estimated population figures for 1915. The difference between the estimate of 30,000 men engaged in building in Cleveland and the figures of Table 2 is largely to be accounted for by the fact that the table includes no estimate of the unskilled laborers engaged in this work.

TABLE 2.—ESTIMATED NUMBER OF MEN ENGAGED IN BUILDING TRADES IN CLEVELAND, 1915

Workers in trade	Number employed
Carpenters	7,105
Painters, glaziers, varnishers	2,746
Plumbers, gas- and steam-fitters	2,014
Bricklayers	1,800
Machine woodworkers	1,198
Sheet metal workers or tinsmiths	1,069
Cabinet-makers	895
Inside wiremen and fixture hangers	750
Plasterers	638
Paperhangers	379
Structural iron workers	356
Roofers and slaters	315
Stone-cutters	292
Lathers	275
Stone masons and marble setters	250
Ornamental iron workers	200
Cement finishers	200
Hoisting engineers	150
Elevator constructors	100
Parquet floor layers	100
Tile-layers	100
Asbestos workers	75
Wood carvers	63
Helpers	926
Apprentices	306
Total	22,302

There are three times as many men in the carpenters' trade as in any other building trade. Next in point of numbers come painters, bricklayers, and plumbers. The number employed is increasing in practically all the building trades. In some the rate of increase is greater than that of the general population; in others it lags behind. Two trades—stone-cutting and paperhanging—showed decreases from 1900 to

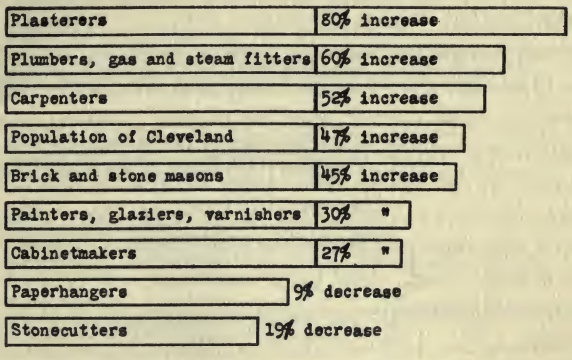


Diagram 2.—Percentage of increase or decrease from 1900 to 1910 in workers in building trades and in the population of Cleveland

1910. The introduction of new machinery undoubtedly explains this in the case of the stone-cutter; the substitution of paint for wallpaper accounts for the decline of the paperhangers' trade.

The relative increase from 1900 to 1910 in each of the several trades compared with that of the total population is shown in Diagram 2.

Many Workers Come from Abroad

The building trades get their workers from four principal sources: immigration, native journeymen from outside the city, helpers, and apprentices. Immigration contributes the largest proportion in both skilled and unskilled work, practically monopolizing the latter. Unskilled workers are mostly of the "new immigration" from southern and southeastern Europe; while skilled workers are of the "old immigration" from northern Europe. Diagram 3 shows the proportion of men employed in each trade in 1910 that were foreign born, native born of foreign parents, and native born of native parents. Over four-fifths of all cabinet-makers, more than two-thirds of all brick and stone masons, and nearly two-thirds of all carpenters are foreign born. Plumbers and steam-fitters show the smallest proportion of foreign born—less than one-third. A very considerable proportion of the native born are of foreign stock.

TABLE 3.—PERCENTAGE OF WORKERS IN FOUR BUILDING TRADES IN 1900 AND 1910 THAT WERE FOREIGN BORN

Workers in trade	1900	1910
Cabinet makers	75	85
Carpenters	56	61
Brick and stone masons	68	67
Plumbers and gas- and steam-fitters	28	32

The trend in four trades is indicated in Table 3, which gives the proportion of foreign born workers

in 1900 and 1910. Reference to the table reveals the fact that cabinet-making showed the greatest relative increase in the number of foreign born.

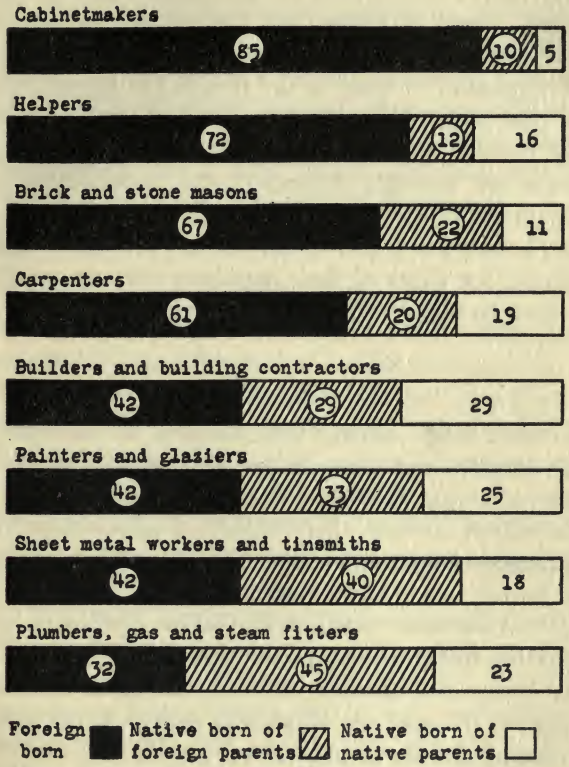


Diagram 3.—Percentage of workers in building trades that are foreign born, native born of foreign parents, and native born of native parents

Workers Drawn from Neighboring Towns

The smaller surrounding cities and towns furnish many workers for the building industry in Cleveland. They are attracted here by the comparatively high wages. Some of these men are not highly skilled workmen, but the requirements as to skill exacted for admission to most of the unions are not so high but that men with country training who come to the city usually manage to meet them. The building trades are strongly organized and membership in the union is considered sufficient evidence that a man knows his trade. Some unions provide special training for those of their members who are unable at once to measure up to Cleveland standards.

Helpers

In some trades—among them those of the structural iron workers and steam-fitters—the unions recognize helpers as apprentices. Carpenters, painters, and a few others increase their supply of journeymen by advancing helpers and even laborers after a longer or shorter period of undirected training. A man gets a job as a laborer or helper and, after working in this capacity until fairly familiar with the trade, quits and looks for a new job, claiming that he is a skilled worker. He may not be able to satisfy the requirements of his new employer, but he will undoubtedly stay with him long enough to learn a little more about the work. By repeating this process several times he will finally learn enough so that he can hold a journey-

man's job. Learning a trade in this fashion is not so common now as it was before the trades became so highly unionized. Helpers and laborers are, by union rules, forbidden the use of journeyman's tools. This, of course, prevents the easy acquisition of the trade. Opportunities for helpers to "pick-up" a trade are found most readily in the smaller non-union concerns of the city, which are engaged almost entirely in repair work. They have contributed a large share of the men to the different trades, and their contribution will probably continue to be large.

Apprentices

A considerable number of the men learn their trades as apprentices. The general decline of the apprenticeship system, which began with the invention of modern labor-saving machinery, has affected the building trades least of all. Here it survives in an active state and is steadily gaining ground. It is in favor with many employers and with all unions. The best apprenticeship systems are found in the strongly organized trades.

It is true that in some trades apprenticeship is little more than a name, meaning simply that permission has been granted to learn the trade. The apprentice is left free to pick up what experience he can between the odd jobs that are given him. What meager instruction he receives comes from a journeyman worker who is none too anxious to give up what he considers the secrets of his trade. The employer

in most cases is too much engrossed in his business to devote much time to the training of apprentices.

The law forbids boys under 16 to work on scaffolds or do any heavy work in connection with building The union regulations provide that boys shall not enter the trades as apprentices or helpers below this age. The limits set by the various trades are shown in Table 4.

TABLE 4.—UNION REGULATIONS AS TO ENTERING AGE OF APPRENTICES IN CLEVELAND

Asbestos workers	Enter at any age
Bricklayers	Between 16 and 23
Carpenters	Between 17 and 22
Cement finishers	Must be full grown
Elevator constructors	Must be full grown
Inside wiremen	Must be 18 years old
Lathers	Between 16 and 21
Painters and paperhangers	Before 21 years old
Plasterers	Between 16 and 18
Plumbers and gas-fitters	Must be 16 years old
Sheet metal workers	Must be over 16 years
Slate and tile roofers	Must enter before 25
Steam-fitters	Must be full grown
Structural and ornamental iron workers	Between 18 and 25

TABLE 5.—UNION REGULATIONS AS TO LENGTH OF APPRENTICESHIP PERIOD IN CLEVELAND

TRADES IN WHICH INDENTURES ARE USUALLY SIGNED	
Bricklayers	4 years
Plasterers	4 years
Sheet metal workers	4 years
TRADES IN WHICH INDENTURES ARE SELDOM SIGNED	
Steam-fitters	5 years
Carpenters	4 years
Inside wiremen	4 years
Plumbers and gas-fitters	4 years
Cement finishers	3 years
Asbestos workers	3 years
Painters and paperhangers	3 years
Slate and tile roofers	3 years
Lathers	2 years
Structural and ornamental iron workers	1½ years
Elevator constructors	varies

Art Museum after seven and one-half months' work, December 29, 1913. Foundation is finished; framework is started

The length of the apprenticeship period in the principal trades, which varies from two to five years, is set forth in Table 5.

Apprenticeship in those trades in which it is customary to sign indentures closely resembles the type formerly common in this country. This apprenticeship is characterized by a closer relationship between apprentice and employer than is usual in the other trades. On p. 38 is a typical form of indenture.

Varying conditions surround apprenticehsip in those trades in which it is not customary to sign indentures. In some of them much care is exercised in training apprentices. The burden of this training, however, is being shifted from the employer to the union. In many trades the apprenticeship system is nothing more than a means for limiting the supply of workers. The apprentices are mature men who have to serve as helpers for two or three years before they are admitted to the union as journeymen. Examinations are exacted by some of the unions to determine the competence of prospective journeymen.

Besides requiring the learners to serve a minimum apprenticeship period, unions limit the number that any firm may employ. The unions assert that to keep wages up to present standards they must prevent an oversupply of workers, and to do this they rely on the apprenticeship system. Table 6 shows some of the limitations established by the unions. When the number of journeymen in a single shop rises, the proportion of apprentices allowed changes, and in

FORM OF APPRENTICESHIP CONTRACT

THIS INDENTURE, made this.....day of.....A. D. 19.... Witnesseth that.....of..... in the County of.....and State of.....now the age of.....years, with the consent of..... his.....hereon endorsed, does hereby, of his own free will, bind himself to serve.....of .....in the County of..... and State of.....an apprentice to said .....in the art or trade of masonry; to learn the art or trade and to continue with and serve said .....for the term of four years, to wit; from the date hereof until..... day of.....A. D. 19.... during all of which time the said apprentice.....shall serve his employer faithfully and honestly, and obey his lawful directions connected with said trade; he will not engage in said art or trade on his own account during the term of his apprenticeship, and will remain faithfully in the employ of said master for the purpose herein mentioned, unless sick or unable to work.

Said apprentice shall attend a technical night school for one year during his apprenticeship.

The said.....master, agrees to keep said apprentice.....employed during the entire building season, and whenever said employer has work, and use the utmost of his endeavors to teach or cause the said apprentice to be taught and instructed in the art and trade mentioned.....in this indenture, in all its branches, during his apprenticeship and shall advance him in the work of said art and trade, that he may thoroughly develop to be an efficient workman therein.

Said Master agrees to keep him in his employ, and not transfer him to any other employer during his term of apprenticeship, and will pay him for his services as follows: First year..... Second year..... Third year..... Fourth year.....

IN WITNESS WHEREOF, the parties aforesaid hereunto set their hands and seals, the day and year first above written.

Signed and sealed in the presence of

.....(Seal)

.....(Seal)

I, the undersigned (parent or guardian), hereby consent to the binding of.....and approve of the purposes, terms and conditions named in the foregoing indenture.

IN WITNESS WHEREOF, I have hereunto set my hand and seal this.....day of.....A. D. 19..

Signed in the presence of

....(Seal)

most cases there is a definite limit as to the number which may be employed.

TABLE 6.—NUMBER OF APPRENTICES OR HELPERS ALLOWED IN VARIOUS BUILDING TRADES

Trade	Number of apprentices
Asbestos workers	Varies
Bricklayers	2 for one contractor
Carpenters	1 for eight journeymen
Cement finishers	Varies
Elevator constructors	1 for one journeyman
Inside wiremen	1 for four journeymen
Lathers	1 for 20 journeymen
Painters and paperhangers	1 for 10 journeymen
Plasterers	2 for one contractor
Plumber and gas-fitters	1 for three journeymen
Sheet metal workers	1 for three journeymen
Slate and tile roofers	Varies
Steam-fitters	1 for one journeyman
Structural and ornamental iron workers	1 for seven journeymen

All obtainable information points to the conclusion that the number of apprentices employed in the city is far below the maximum permitted by the unions. Many large contractors have no apprentices and say they will not bother with them. Others state that they have been unable to get good apprentices or to keep them when they found them, and have therefore given up the plan.

Summary

1. There are about 30,000 men engaged in the building industry in Cleveland at the present time. Nearly two-thirds of them are in the skilled trades.

2. The journeymen in the industry come either from abroad, or from outside the city, or else they advance from jobs as helpers or apprentices.

3. Immigration contributes the largest proportion

of both skilled and unskilled workers. Most of the skilled workers are of the "old immigration" from northern Europe, while nearly all the unskilled workers are of the "new immigration" from southern Europe. The proportion of foreign born in most of the principal trades is steadily increasing. About two-thirds of the carpenters are foreign born.

4. A large number of building workers come from surrounding towns, attracted by high wages.

5. Many who are now regular journeymen were formerly helpers. In some trades the unions recognize helpers as apprentices. Small non-union concerns, engaged almost entirely in repair work, offer the best opportunities for advancement to the journeyman class.

6. A considerable number of beginners receive preliminary training as apprentices. The general decline of the apprenticeship system, which began with the invention of modern labor-saving machinery, has affected the building trades least of all. The most complete apprenticeship systems are found in the most strongly organized trades. The unions do not permit boys to enter the trades as apprentices before they are 16 years old; a state law forbids them to work on scaffolds under this age. The length of the apprenticeship period varies from two to five years in the several trades. The burden of training apprentices is shifting from the employer to the unions. For the purpose of keeping down the supply of workers the unions limit the number of apprentices a contractor may have in his employ.

CHAPTER III

CONDITIONS OF LABOR

The building trades are among the most strongly organized in the city. It is estimated that their unions at the present time include about 90 per cent of all the men engaged in building work. Practically all the large contracting firms employ only union men. Non-union workers are usually employed by small contractors.

The strength of the unions in the building trades can be accounted for in several ways. Probably the chief reason is that building contractors have resisted union organization among their workmen less than most employers, for, unlike manufacturers of goods which must compete in outside markets, they can immediately pass the extra cost involved in wage increases on to the owner or buyer. As the product is one that is locally produced and used, and as it is also immediately disposed of, the contractor can adjust his selling price to the wages he must pay more quickly than can the manufacturer of articles for general consumption throughout the country or abroad. Since the unions are strong enough to enforce uniform rates of pay, thus equalizing the conditions of competition for all contractors, there is

little opposition to organization on the part of the employers.

The unions and the contractor usually work together under a mutual agreement, either oral or written, which governs wages, hours of labor, and apprenticeship regulations. The following classification, based on statements of employers and union officials, shows the relative strength of union organization in the various trades:

Well Organized
- Bricklayers
- Cement finishers
- Inside wiremen or electricians
- Plasterers
- Plumbers
- Sheet metal workers
- Steam-fitters
- Stone-cutters
- Stone masons
- Structural iron workers

Fairly Well Organized
- Carpenters
- Painters and paperhangers
- Tile layers

Poorly Organized
- Building laborers
- Cabinet-makers
- Machine woodworkers

Requirements for admission to the different unions vary to a marked degree, the condition of the union and the supply of workers determining these requirements to some extent. If the union is strong and has a good control over the situation, admission fees are

higher and regulations as to apprentices and helpers are more stringent than if the union is fighting to gain a foothold.

One of the important results of this strong union organization in the building trades has been the establishment and maintenance of good wages. Another result is the determination of the work that a man may do in a given trade. From time to time, as new materials have been introduced, controversies, or jurisdictional disputes, as they are called, have arisen between the different trades. For example, though the increased use of metal trim there developed a dispute between the sheet metal workers and the carpenters as to which should place it. The American Federation of Labor at its last meeting in San Francisco awarded this work to the carpenters.

Still another result of union organization has been to transfer to the workmen of certain trades various kinds of work formerly done by common laborers. One of the most striking examples is found in the placing of steel used in reinforcing concrete. Until 1914 this was commonly done by laborers. At that time the structural iron workers were able to force employers to grant them this work. Now laborers can be employed only on the loading and unloading of the steel. It must be set in place in the forms by structural iron workers.

Earnings

No industrial workers in the city are paid better wages than those employed in the building trades.

The diagam below shows that the proportion of men earning $25 a week or over in building work is nearly a third larger than in clothing factories, twice that in automobile factories, and more than seven times the proportion employed in foundries and machine shops. One-half of the total number em-

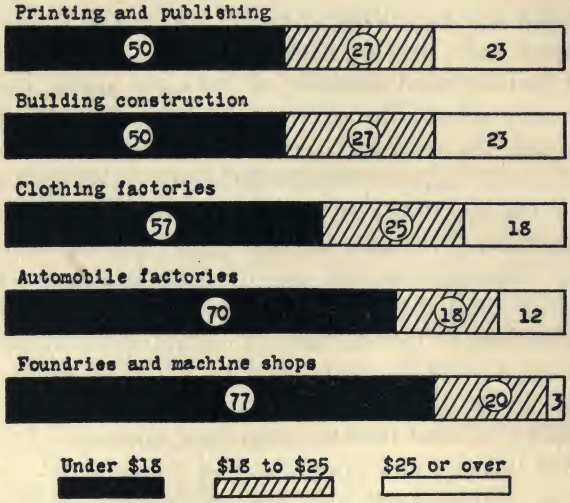


Diagram 4.—Percentage of men employed in building construction and in four other industries earning less than $18 per week, from $18 to $25 per week, and $25 or over per week

ployed earn over $18 per week. This is a much better showing than is made by any of the other industries compared, with the single exception of printing and publishing. The high earnings in building are of even greater significance when it is remembered

that the men generally work a much shorter day than those in other industries.

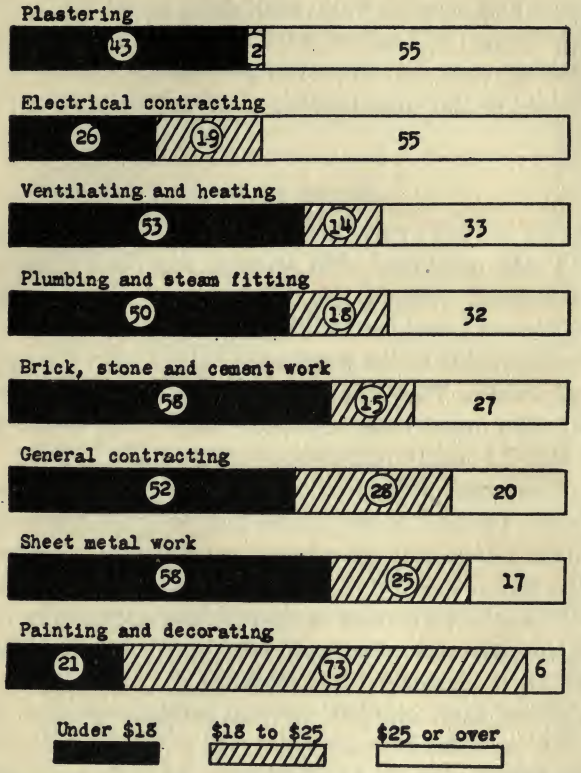


Diagram 5.—Percentage of men in each of eight building industries earning less than $18 per week, from $18 to $25 per week, and $25 or over per week

A comparison of earnings in the various branches of building work is shown in Diagram 5. The largest

proportion earning $18 a week and over is found in electrical contracting, and the smallest in brick, stone and cement work and sheet metal work. In brick, stone and cement work 58 per cent of the whole number earn less than $18 per week. This is due mainly to the large number of laborers employed.

Rates of Pay

So far we have considered the actual earnings of all the men employed. No attempt has been made to distinguish between the different trades or between skilled and unskilled workmen. Now we come to a consideration of the wage rates paid men in the various trades. They are strongly unionized and therefore the union scale of hourly wage rates shown in Table 7 is fairly representative.

The wages of foremen are not included in this table. In most of the trades they are paid about 50 cents a day more than journeymen, while in others, like plumbing, where the working force on a given job is small, the man in charge does not usually receive extra pay. His additional compensation takes the form of steadier employment.

More than one-half of the building workers in Cleveland are in trades that pay an hourly wage of 50 cents or over. The highest paid men, receiving 70 cents an hour, are bricklayers, boom derrick hoisting engineers, stone masons, and structural iron workers. The only skilled workmen who receive under 40 cents an hour are cabinet-makers.

TABLE 7.—UNION SCALE OF WAGES IN CENTS PER HOUR IN THE BUILDING TRADES, MAY 1, 1915

70 Cents	
Bricklayers	70.00
Hoisting engineers on boom derricks, etc.	70.00
Stone masons	70.00
Structural iron workers	70.00
From 60 to 70 Cents	
Marble setters	68.75
Inside wiremen	68.75
Plasterers	68.75
Slate and tile roofers	67.50
Parquet floor layers (carpenters)	62.50
Lathers, first class	62.50
Plumbers	62.50
Steam-fitters	62.50
Stone-cutters	62.50
Hoisting engineers, brickhoists	60.00
Elevator constructors	60.00
From 50 to 60 Cents	
Tile layers	59.38
Lathers, second class	56.25
Carpenters	55.00
Cement workers, finishers	55.00
Sheet metal workers	50.00
Painters	50.00
Paperhangers	50.00
From 40 to 50 Cents	
Asbestos workers	47.50
Composition roofers	42.50
Under 40 Cents	
Cabinet-makers and bench hands	37.50
Machine woodworkers	37.50
Electrical fixture hangers	37.50
Hod-carriers	35.00

An analysis shows that skill is not the chief factor in determining wages in these trades. The trades in the highest wage group shown in the table require only a small amount of technical knowledge. The factor which contributes most largely to securing

and maintaining high wages is the strong union organization. Wages are also influenced by irregularity of employment and the amount of hazard connected with the work.

A high degree of skill in a given trade brings little advantage in the matter of wages. By establishing a minimum scale below which no journeyman shall work the union practically sets a flat rate of pay for most of the men in the trade. For example, by agreement between the union and the contractors, carpenters' wages are fixed at 55 cents an hour. This means that the carpenter who does exceptionally good interior work, requiring the skilful use of a number of hand tools, earns no more than the carpenter who makes rough board forms for concrete with no other tools than a hammer and saw. The skilled worker's reward comes only rarely in increased wages. If he can manage men well he may in time become a foreman. When there is much building work and good men are scarce, contractors sometimes pay higher wages to skilled workmen in order to secure their services. As a rule, however, their reward comes in the form of steadier employment. The less skilled man is the first to be laid off when business is slack, while the first-class workman, for the reason that he is so hard to replace, is the last to be discharged.

In those building trades where the work is indoors and where it is the steadiest, we find the lowest wages. This is well shown in the case of cabinetmakers, most of whom are as highly skilled as

carpenters, and if on outside work would undoubtedly earn carpenters' wages. But in order to be employed inside on fairly steady work and to live near their jobs, they are willing to work for about 20 cents less an hour and to work two more hours a day. The same thing is true of men who work in the maintenance departments of factories and mills. Their wages are lower and the hours longer than in construction work in the same trades. It should be added, however, that as a rule the work they do does not require as much skill. They are not members of a union. A comparison of hourly wages paid for indoor work, and outdoor work, is presented in Table 8. When

TABLE 8.—HOURLY RATES FOR CONSTRUCTION AND MAINTENANCE WORK IN CENTS PER HOUR

Workers in trade	Union scale in construction work	Usual wages in maintenance work
Bricklayers	70.0	44.5
Steam-fitters	62.5	30.0
Carpenters	55.0	31.0
Sheet metal workers	50.0	33.0
Painters	50.0	33.6

we compare the hourly wages of workers in the building trades with the wages of men in other industrial occupations, we find that the former are among the highest paid in industry. The usual hourly wages in the five largest trades outside of the building industry are shown in Table 9 on page 50. The hourly rate for compositors is the only one that approaches those received in the majority of the building trades.

TABLE 9.—USUAL HOURLY WAGES OF FIVE LARGEST BUILDING TRADES AND FIVE LARGEST OTHER TRADES

Workers in trade	Cents per hour
Bricklayers	**70.00**
Plumbers, gas- and steam-fitters	**68.75**
Carpenters	**55.00**
Hand compositors and linotypers	41.67 to 53.75
Bakers	24.07 to 52.08
Painters	**50.00**
Sheet metal workers	**50.00**
Blacksmiths	44.44
Molders	38.89
Machinists	35.00

Wages in Cleveland compare favorably with those in other large cities of the country. The table below, compiled from data issued by the Builders' Association of Chicago, gives the hourly rates of wages paid in the five leading building trades in 16 large cities.

TABLE 10.—MAXIMUM HOURLY RATE OF WAGES OF WORKERS IN THE FIVE PRINCIPAL BUILDING TRADES IN 16 LARGE CITIES, JULY, 1915

City	Bricklayers	Carpenters	Painters	Plumbers	Sheet metal workers
Baltimore	.70	.43¾	.37½	.50	.40
Boston	.65	.57	.55	.65	.55
Buffalo	.65	.50	.46⅞	.56¼	.50
Cincinnati	.70	.60	.55	.62½	.47¼
Cleveland	**.70**	**.55**	**.50**	**.68¾**	**.50**
Detroit	.70	.50	.50	.60	.50
Indianapolis	.75	.55	.50	.62½	.55
Kansas City	.75	.65	.60	.68¾	.62½
Milwaukee	.67½	.50	.50	.62½	.50
Minneapolis	.70	.50	.50	.62½	.45
New Orleans	.62½	.45	.40	.56¼	.45
Pittsburgh	.70	.62½	.58⅓	.68¾	.57½
San Francisco	.87½	.62½	.62½	.75	.68¾
Seattle	.75	.56¼	.56¼	.75	.56¼
St. Louis	.70	.62½	.62½	.75	.60
Washington	.66⅔	.55	.50	.56¼	.50

During the past few years wages in these trades have been steadily rising. Table 11 offers a comparison, based on union rates, of the hourly wages paid in 1907 and 1915.

TABLE 11.—UNION WAGE RATES IN 1907 AND 1915 IN PRINCIPAL BUILDING TRADES IN CLEVELAND

Workers in trade	1907	1915
Bricklayers	.60	.70
Structural iron workers	.60	.70
Plasterers	.56¼	.68¾
Marble setters	.50	.68¾
Steam-fitters	.50	.62½
Stone masons	.50	.70
Carpenters	.45	.55
Inside wiremen	.45	.68¾
Painters	.40	.50
Sheet metal workers	.37½	.50

Exact information is not obtainable, but data which will help in determining how much building workers make per year are found in the report of the Ohio Industrial Commission published in 1915 and giving data for 1914. Using its unemployment figures, and simply taking into account time lost through actually being off the payroll (without considering either overtime or part time), an estimate of average yearly earnings in the five largest building trades and in the five largest trades not engaged in building, is shown in Table 12 on page 52.

Many unions—among them those of the carpenters, bricklayers, and painters—make no provision as to wages of apprentices. They are chiefly interested in having the learners serve the full apprenticeship

period. His future wage as a journeyman gives them more concern than his present wage as an apprentice. Table 13 shows the wages in three of the building trades that have established a uniform scale for apprentices. Sheet metal apprentices are paid a bonus of $1.00 extra for each week served.

TABLE 12.—ESTIMATED AVERAGE YEARLY EARNINGS IN THE FIVE LARGEST BUILDING TRADES AND THE FIVE LARGEST OTHER TRADES IN CLEVELAND

Workers in trade	Yearly earnings
Plumbers	**$1223**
Bricklayers	**1191**
Blacksmiths	1059
Compositors and linotypers	1038
Sheet metal workers	**1030**
Molders	1022
Carpenters	**969**
Machinists	920
Bakers	917
Painters	**830**

TABLE 13.—USUAL WEEKLY WAGES OF APPRENTICES IN THREE BUILDING TRADES IN CLEVELAND

Year	Inside wiremen	Plasterers	Sheet metal workers
First year	$5.50	$5.50 to $6.25	$5.00
Second year	13.20	8.25 to 11.02	5.50 to 6.00
Third year	17.60	13.75 to 16.00	6.50 to 7.00
Fourth year	22.00	19.25	8.00 to 9.00

In another group of trades, helpers are officially recognized by the unions. They correspond to the apprentices in the trades above mentioned, but must be adults or at least capable of doing a man's work. They are paid higher wages than apprentices. The union scale of wages for helpers is given in Table 14 on page 53.

TABLE 14.—UNION SCALE OF HOURLY RATES FOR HELPERS IN SIX BUILDING TRADES

Trade	Rate per hour
Structural iron work	40.00
Elevator construction	40.00
Slate and tile roofing	37.50
Cement finishing	35.00
Steam-fitting	31.25
Tile laying	31.25

Hours

Eighty per cent of the contracting firms in Cuyahoga County engaged in building report that their men work an eight-hour day—from eight in the morning to four-thirty in the afternoon, with a half-hour for lunch. Only cabinet-makers, machine woodworkers, and general laborers work longer hours—usually nine. Many of the trades work only a half day on Saturday throughout the year; practically all have this half-holiday during the four summer months. For holiday or overtime work the men receive either pay and a half or double pay.

Regularity of Employment

In common with other industries, building is affected by general business conditions. In addition, there are several other factors influencing employment, among them the seasons and the weather. The nature of building operations and the organization and manner of conducting the business tend further to affect regularity of employment. The workers in

many factory industries are engaged in manufacturing staple articles of standard shapes and sizes for which there is a fairly steady year-round demand. During slack seasons they can be employed in making an extra supply to meet the heavier demands of the busy season, thus enabling these industries to keep a regular force of men steadily employed. This condition does not prevail to any considerable extent in building work as there are but a few standardized houses, although standardized parts of houses, like windows and doors, are now quite common. The fact that these can be made and stored for future use is one of the reasons why employment in woodworking mills is steadier than in any of the outside building trades. This, however, accounts for only a small proportion of the workers in the entire industry. Each house is a special job. Even though some of the parts are factory made, the assembling has to be done where the house is permanently to stand. This prevents anticipating in any way the work of the busy season. The demand for a particular house at a particular time has developed, to a high degree, the "bid" system in the selling of building construction. Few contracts are made by any other method.

Under these conditions, it is quite evident that it is next to impossible for a building contractor to keep a large force employed all the time. He can use men only when he has made successful bids. One result of this situation is that men in the building trades change employers more than any other workers in

Snow often interrupts building work

industry. It requires the most careful management on the part of the contractor and his foremen to keep the job moving so that the frequent changes in the labor force due to the variety of work do not cause the men to lose time. Lack of material when needed also results in loss of time.

As a consequence of all these conditions there is greater irregularity of employment in building trades than in any of the other leading industries. The report of the Ohio Industrial Commission contains information showing the changes from month to month during the year 1914 in the number employed in building work. The data given are for Cuyahoga County as a whole, but they are fairly typical for the city as nearly nine-tenths of the entire population of the county reside here. The year 1914 was marked by very hard times and so was not truly representative, hence these figures cannot be taken as an absolute measure of the usual employment in the industries reporting. But they are indicative of the relative standing of the several industries in this respect.

Diagram 6 on page 56 shows the fluctuation during 1914 in the size of the working forces in the building industry and the printing industry. The number in each industry during the months of greatest employment is represented by 100 per cent. Comparison is made with printing because the workmen in both industries are strongly organized and well paid.

It will be observed that the smallest force employed by the building contractors was in February, when they had on their payrolls less than half the number

they had in September. Also in January, March, and December only about two-thirds as many men were at work as in September. In other words, out of every 100 men employed in September more than 50 were either out of work, or were working outside of the county, or in a different industry during Feb-

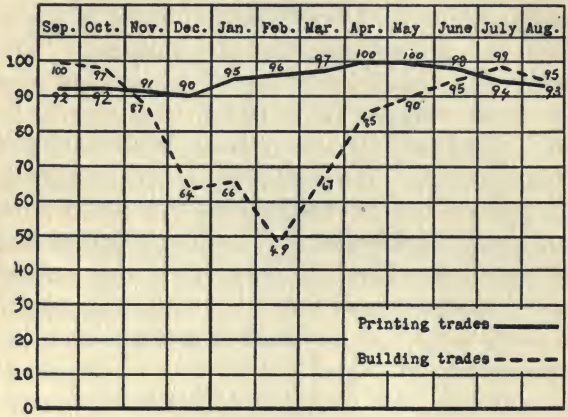


Diagram 6.—Percentage of men in the printing trades and in the building trades employed each month during the year. The largest number employed in any one month is taken as the base and is represented by 100 per cent

ruary. The average working force throughout the year was about 80 per cent of that employed in September.

If this situation is compared with that which exists in the printing industry, it will be noted that in December, when the smallest force was employed, they had on their payrolls 90 per cent of the number

they had in April which was the month of greatest employment. Less than 10 per cent of the men in the printing industry were out of work, or had to change employment some time during the year, as compared with 50 per cent in building. The average force employed in printing for the year was about 95 per cent of the maximum, as against 80 per cent in building.

Other figures in the report of the Industrial Commission tend to show that building workers do not enter other occupations during the winter months. The only industries open to them would be those which report a large working force for the months when building is quiet. The industries which reach their maximum during February, when most building workers are unemployed, are those manufacturing fancy and paper boxes, brass and bronze products, chemicals, acids and wood distillation, women's clothing, foundry and machine shop products, furniture, gas and electric fixtures, and shipbuilding. Even if we can imagine them undertaking the work, there is not room enough in all the industries for the building employees idle every winter.

The relation between the smallest and the largest number employed in 1914 in the principal building industries is shown in Diagram 7 on page 58. Contractors say that plasterers, brick and stone masons, painters, carpenters, and cement workers, lose the most time, and their statements are confirmed by data from the Industrial Commission report. It is true that these data were not gathered for each trade

separately, but they do indicate the size of the working force in the different kinds of building construction. The report clearly shows that during the slack

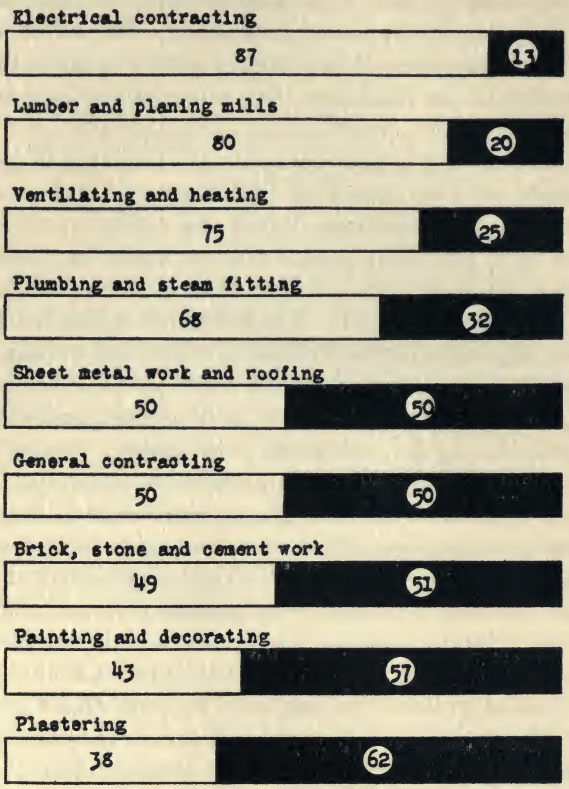


Diagram 7.—Sections in outline represent percentage of men employed and sections in black percentage of men unemployed in each of nine building industries at the time when each industry showed the largest percentage of unemployment

season in 1914 firms engaged in general contracting, brick, stone, and cement work; sheet metal work; painting and decorating, and plastering, employed less than half as many men as during the busy season. In the case of the plasterers the proportion employed in the dull season fell to about one-third. Electrical contracting, in which less than 15 per cent were unemployed at any time during the year, showed the most stable working force.

A better idea of the unemployment situation is obtained by considering the relation between the average and the largest working force. Such a comparison is presented in Diagram 8. The best showing is made by electrical contracting in which the average number employed is 93 per cent of the maximum working force, and the poorest, in plastering where the average is only 66 per cent of the maximum.

New methods, such as the introduction of fires, tents, and canvas for winter work, have all tended to reduce the total amount of unemployment. Also, people are beginning to realize that it is more economical to get buildings started so that at least a part of the work can be carried over into the slack season.

Health Conditions and Accident Risks

On the whole, health conditions in building work are good. The worker is in the open air most of the time and even much of the inside work is necessarily done before the building is entirely closed in. Also, the very nature of the work requires continual activity.

For the most part the materials used are not injurious to health if reasonable precautions are taken and ordinary habits of cleanliness observed.

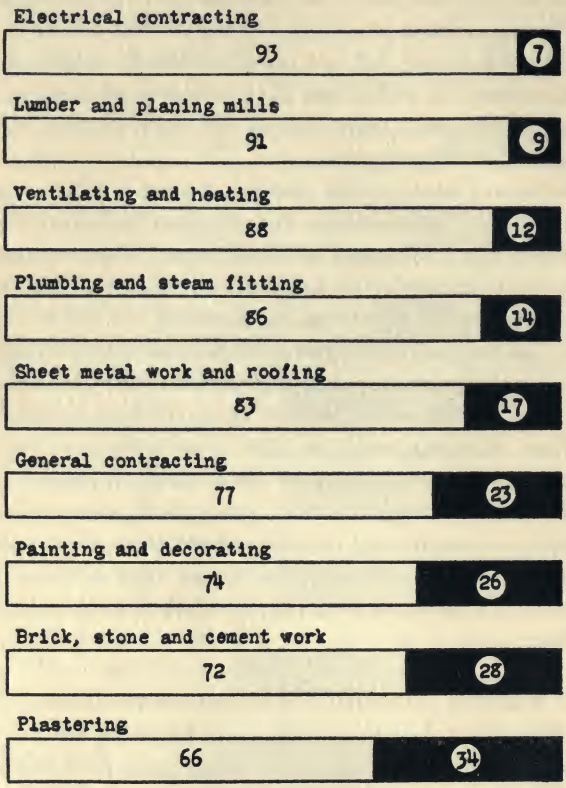


Diagram 8.—Sections in outline represent average percentage of men employed and sections in black average percentage of men unemployed during the year in each of nine building industries

Unless the precautions are taken there is always more or less danger in the plumbing and painting trades. In repair work, the plumber often meets conditions which demand extreme care if he would avoid disease. Faultily installed sewer systems and plugged pipes and traps often menace the health not only of the householder but also of the plumber who repairs the defective work. There is, however, little danger for the workman engaged in installing new plumbing, as lead pipes are now seldom used.

In painting there is considerable danger from lead poisoning, both from the handling of fresh paint and from the dust which is stirred up when old surfaces are sand-papered in preparation for a new coat. Besides lead, other dangerous materials used in painting are turpentine, naptha, and wood alcohol.

The fine sawdust which the machines in woodworking mills produce, is injurious to health. Most mills, however, now have special blow pipes connected with every machine which remove practically all this dust and reduce the danger from this cause to a minimum.

Much building work has to be done on scaffolds, so there is, in almost all these trades, some danger of falling. Among the men who run these risks are bricklayers, painters, sheet metal workers, carpenters, and all kinds of roofers. This danger is more pronounced, of course, in the construction of large buildings. Structural iron work is one of the most hazardous trades.

Accidents frequently happen in mill work, because

nearly all of the machines run at a very high rate of speed and are necessarily more or less open. Mechanical guards are used wherever possible.

Promotion

The building trades offer many opportunities for advancement. One reason for this is the large number of supervisory positions made necessary by the varying character of the work. In this respect building is altogether unlike many types of manufacturing in which the worker performs the same operation day after day, and after a short preliminary learning period, needs little supervision. This makes possible the employment of large groups under the direction of one man. Building operations, however, cannot be organized in this manner. It is next to impossible to keep a man making the same parts of a house day after day. To be sure, building contractors do this as much as they can, for it is always profitable to keep men on the work they do best.

Buildings are almost as different as people. While it is true that houses have certain essentials common to all, such as foundations, walls, roofs, doors, windows and so on, it is also true that these parts are made of different materials and in different forms. "Ready to live in" houses of the same identical pattern and style are not popular. Instead, houses are usually made to order, taking into full account the wishes, not to mention the whims, of those who are to live in them. This requires that everything be

carefully planned and shown in drawings and specifications. It prevents the building contractor from giving one of his carpenters a sample window frame, and another a sample door frame, with directions to make enough frames like the sample for the whole building. It is much more probable that each frame and each part of the building will have to be worked out separately from a detailed drawing. The direction of these separate bits of work requires close supervision to see that they are done according to drawings and specifications, and to prevent needless duplication.

The number of men employed under a single foreman varies in the different trades and it also varies within some of the trades according to the size of the jobs. Sheet metal workers and plumbers, for example, work in small groups and the man in direct charge is usually a working foreman. This is also true of painters and plasterers, except on large jobs. On a small job a carpenter or bricklayer foreman, in addition to supervising the five or six men in his force will probably do the work of a regular journeyman. With a group of 20 men he would have to devote all his time to supervision.

A foreman in almost any of the trades must be able to read plans, as he must lay out the work. He must also know what good work is, for the contractor looks to him to keep everything up to required standard. It is not necessary for him to be the most skilled mechanic in the force. Employers and superintendents say that in selecting foremen they lay about equal weight on skill and ability to handle men.

As a rule foremanship carries with it higher wages, although in some cases the pay is the same as that of the regular journeyman. The reward for the added responsibility comes in the form of steadier employment. It is not uncommon for foremen to be hired on a salary basis and carried on the payrolls throughout the entire year.

Positions as superintendents are usually filled by engineers who are graduates of technical colleges, although journeymen occasionally work up to these positions.

Small contracting offers another form of advancement. It requires but little initial investment to make a modest beginning, because individual workmen in the various building trades provide their own tools and few expensive machines are required. Comparatively little working capital is necessary, as provision is made in most contracts for part payments as the work progresses.

Summary

1. About 90 per cent of all the men engaged in building work are members of labor unions. Building contractors have resisted union organization among their workmen less than most employers in manufacturing industries. Agreements between unions and contractors govern wages, hours of labor, and apprenticeship regulations. Union organization has raised wages, defined the work of the various trades, and transferred to the workmen of certain trades various kinds of work formerly done by common laborers.

2. No industrial workers in the city are paid better wages than those employed in the building trades. The fact that the men usually work a much shorter day than those in other industries make their high wages even more significant.

3. More than one-half of the building workers in Cleveland are in trades that pay an hourly wage of 50 cents or over. The union wage scale for skilled workers ranges from 37.5 cents an hour for cabinetmakers to 70 cents for brick and stone masons, structural iron workers, and hoisting engineers.

4. The strength of the unions is a greater factor in the establishment and maintenance of wage standards than skill or technical knowledge. This has resulted in practical uniformity of wages within each trade.

5. Building workers in the maintenance departments of factories have steadier employment, but receive lower wages, than those employed on construction work.

6. The beginning wage of apprentices, in those trades which have established a uniform scale, ranges from $5.00 a week to $6.25, and in the fourth year from $8.00 to $22.00. Many unions make no definite provision as to apprentice wages. Helpers in some trades are officially recognized by the unions and are paid higher wages than apprentices.

7. The eight-hour working day is practically universal. A half holiday on Saturday is customary in most of the trades.

8. Irregularity of employment is greater in build-

ing work than in any of the other leading industries in the city. The largest working force is employed in September and the smallest in February. The fluctuation is about 50 per cent. The average number employed is about 80 per cent of the maximum.

9. In general, health conditions in building work are good; in the plumbing trade there is some danger from infection in repair work, and in painting, from lead poisoning. In nearly all of the trades there is considerable danger from accidents.

10. The building trades offer many opportunities for advancement, because of the large number of supervisory positions. Many workmen finally become small contractors.

CHAPTER IV

TRAINING BEFORE THE BOY LEAVES SCHOOL

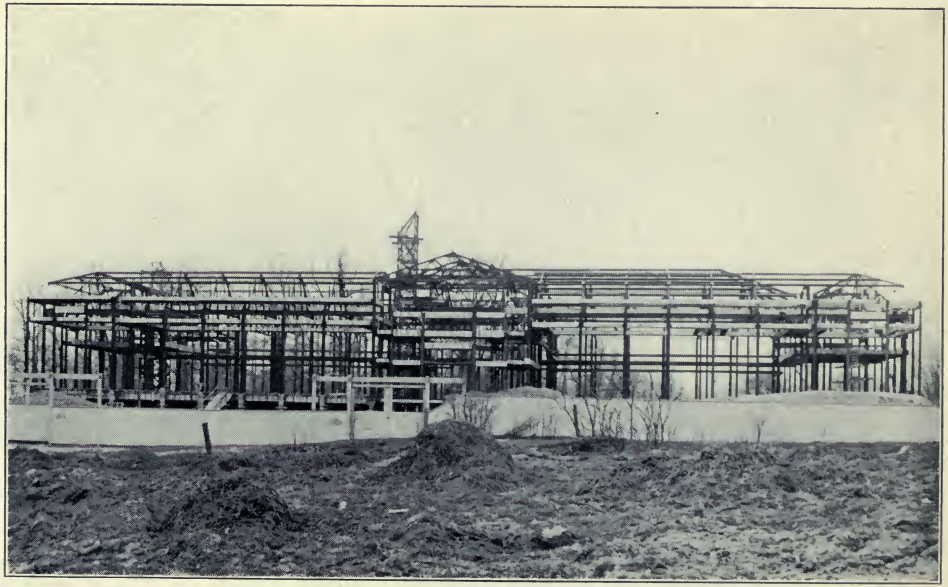
When we take up the problem of industrial training for these trades in the public schools we are immediately confronted with certain basic educational facts which determine both the time available for such training and the type of school organization necessary for effective work.

In the first place, few of the boys who will engage in the building trades go beyond the eighth grade and less than 60 per cent complete the elementary course. The actual extent to which these boys avail themselves of the privileges and advantages of the public schools is indicated by the results of an investigation conducted by the Survey Staff in the spring of 1915, covering 5,000 young people under 21 years of age at work in Cleveland. Approximately 31 per cent of the boys employed in the building industry stopped school at the end of the sixth grade or before, 27 per cent at the end of the seventh grade, and 35 per cent at the end of the eighth grade, while only seven per cent completed as much as a year in high school. It is true that when many of them left school the age limit for compulsory attendance was lower than

at present. A study of their ages shows, however, that even had the present law been in operation when they were in school, the percentages given above would not have been materially altered.

Putting the best possible light on the situation, it seems to be clear that whatever is done in the way of training boys for the building trades must be started in the seventh grade. If it is delayed until the eighth grade, over one-half of the boys will have already left school, because so many are retarded from one to three years that they reach the end of the compulsory attendance period by the time they complete the seventh grade. The most important contribution to vocational education the elementary schools could make would be to carry the boys forward through the grades at the rate of one grade each year, so that they might enter the junior high school or a trade school in which vocational education is possible at least two years before the law permits them to leave school and go to work.

In the second place, it is doubtful whether training at all closely related to these trades can be given in the regular elementary schools as they are now organized. There is general agreement among educators that vocational training cannot be profitably undertaken before the pupil reaches the age of 12, nor before the beginning of the seventh grade. The number of boys in the seventh and eighth grades of the average elementary school is too small to permit the differentiation of courses which is indispensable for successful vocational training.



Art Museum after 10 months' work, March 17, 1914. Steel framework is completed

Take, for example, a school with an enrollment of 800 pupils, which is higher than in most Cleveland elementary schools. There would be about 400 boys in all, of whom approximately one-sixth, or between 60 and 70, would be enrolled in the seventh and eighth grades. As about seven-eighths of them are of native birth, we may assume that when they grow up they will be distributed in the various wage-earning occupations in approximately the same proportions now found in the native working population. These proportions vary in the different trades. There are 26 carpenters to each 1,000 native born workers, 15 painters, 12 plumbers and gas- and steam-fitters, six sheet metal workers, and so on down to cabinet-makers, who number one to each 1,000. Applying these figures to our group of 60 or 70 seventh and eighth grade boys, we find there would be in the school about two future carpenters, one painter, and one plumber, the remainder of the trades being represented by less than one each. All of them combined would give a class of only six or seven boys.

No argument is necessary to prove that differentiation of courses based on classes of this size is administratively impossible. It may be laid down as one of the conditions essential to success in vocational training that the school administrative unit must contain a sufficiently large group of the kind of boys who need special training to warrant the expense for teachers and equipment. This condition cannot be met in the elementary schools.

The junior high school plan, tentatively adopted by the Cleveland educational authorities at the beginning of the present school year, offers a much more hopeful field in which to attempt a solution of this problem. Here we find an enrollment of four or five hundred seventh and eighth grade boys nearly all of whom are at least 12 years old. An application of the occupational distribution figures gives a very different result from that obtained in the elementary school. In a junior high school enrolling 500 boys there will be between 40 or 50 who may be expected to enter the building trades. This number is sufficient to justify some consideration of a general industrial course, although those who are likely to go into any particular trade are still too few to make specialized trade training feasible.

By a general industrial course is meant a differentiated course which, through the system of elective subjects now in use in the junior high school, would give to those boys who will probably enter industrial occupations after leaving school, or who intend to take the technical high school course, an opportunity to devote a considerable proportion of their school time to subjects which would prove of practical value in industrial work. About one-third of the boys in the school would be helped by a course of this kind. On the other hand there is no good reason for imposing it on all the boys in the school. Those who expect to take an academic high school course or who wish to enter commercial or professional occupations can

more profitably devote their time to other subjects in the curriculum.

What the industrial course shall consist of must be worked out from the standpoint of the industrial trades as a whole rather than from that of any particular group, for the reason that the number of boys in a junior high school who will enter a particular trade is not enough to justify special equipment or special teachers. The problem is treated from this general point of view in the summary volume of the industrial education reports of this Survey series, entitled "Wage Earning and Education." In the present study we mention, however, some of the types of instruction which the course must include if it is to be of value to prospective building workers.

Mathematics

Of the subjects taught in school which have a direct value to the workmen in these trades none is so important as mathematics. Every kind of building work calls for the constant use of simple arithmetical operations, and many of the trades require a knowledge of common and decimal fractions, percentage, mensuration, square root, geometrical forms, and sufficient acquaintance with equations so that formulas can be used.

It is true that many skilled building workers do not possess a thorough knowledge of arithmetic. It does not follow, however, that they do not need it. So long as they work under the direction of foremen

who can plan and lay out the work for them they have no trouble, but they are unable to do independent work. Due to their lack of early training, the acquisition of trade knowledge is a long and laborious process. Even in the case of that common measuring and computing instrument, the steel square, they spend years picking up piecemeal a knowledge of its use in working out simple problems in geometry and trigonometry, which a thorough grounding in elementary mathematics would enable them to master in a few days' practice.

There is little foundation for the current assumption that the handbooks published for use in these trades form an adequate substitute for mathematical training. The worker can usually find in handbooks a rule for doing almost anything, but the rule is useless unless he knows how to apply it. Let us suppose, for example, that a carpenter has to lay out wooden centers for circular arches. He consults one of the best known builder's handbooks and finds the following rule:

> "To find the radius of an arc, when the chord and rise are given:
>
> Rule—Square one-half the chord, also square the rise; divide their sum by twice the rise; the result will be the radius."

To use such rules the workman must not only be able to perform the computations required but also be familiar with mathematical terminology. Illustrations of this kind can be multiplied. The ordinary

handbook presupposes that the man who is to use it has had a fairly complete training in mathematical principles as applied to surfaces and areas.

In view of the need for a thorough understanding of mensuration and geometrical forms by most skilled workmen, a change in the present arithmetic course should be considered. The course as now taught in the seventh and eighth grades is as follows:

Seventh Grade—First Half
1. Checking results
2. Percentage
3. The equation
4. Commercial discount
5. Simple interest
6. Time

Seventh Grade—Second Half
1. Profit and loss
2. Commission
3. Insurance
4. Ratio
5. Banking

Eighth Grade—First Half
1. Taxation and revenue
2. Customs and duties
3. Stocks and bonds
4. Algebra

Eighth Grade—Second Half
1. Mensuration
2. Algebra
3. Constructional geometry

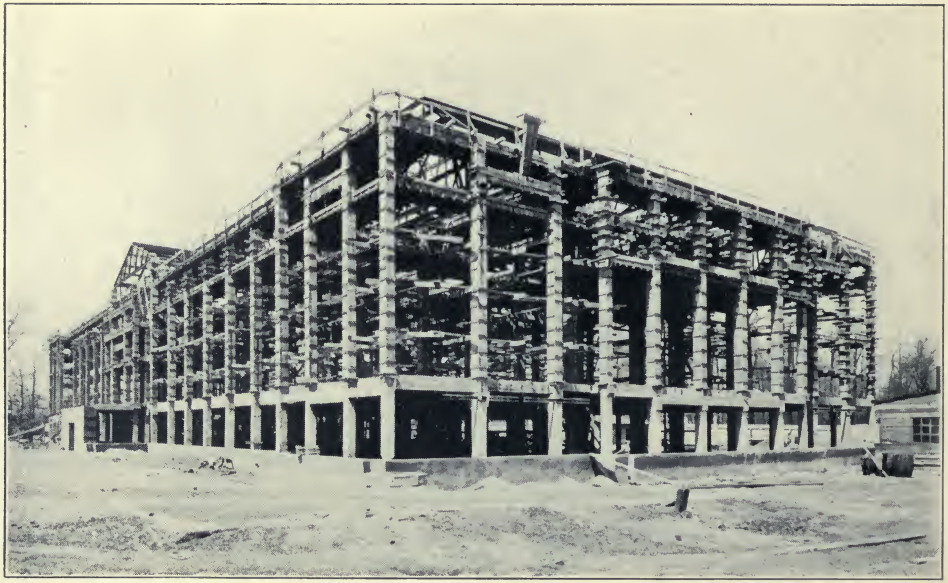
A large majority of the boys who will later enter the building trades do not finish the eighth grade, and many do not stay in school beyond the seventh grade.

This means that the part of their arithmetic which will be of most value to them after they go to work is so far along in the course that most of them never reach it. In the opinion of the Survey Staff, mensuration and constructional geometry should be given in the seventh grade. This might result in putting profit and loss, commission, insurance, and banking into the eighth grade. None of these subjects is of great importance to boys who become industrial workers. The average carpenter or bricklayer will have few occasions to use even a general knowledge of stocks and bonds, or customs and commissions. In fact some of the work now given in the second half of the seventh and the first half of the eighth grade may well be omitted in the industrial course and the time thus gained be devoted to more advanced work in mensuration and geometry.

Applied mathematics is the backbone of industrial training. Building employers complain less about ignorance of arithmetic on the part of their apprentices than of inability to apply arithmetic. What is needed in the school is more practice in the application of mathematical principles to real problems. It is in developing the pupils' ability to use in a definite and concrete way their knowledge of mathematics that the shop classes yield their greatest educational returns.

Shop Work

The present course of study requires of all the boys one hour a week of manual training in woodwork, and



Art Museum, after eleven and one-half months' work, May 2, 1914. Everything ready for cement to be poured

those who wish may elect two and one-half hours additional work in this subject. It is closely related to but one of the building trades—cabinet-making—although it also has some resemblance to certain types of carpentry. It bears no direct relation to plumbing, electrical wiring, sheet metal work, bricklaying, stone setting, painting, or any of the other building trades. It gives some familiarity with the principles involved in the simpler shaping and assembling operations, and practice with a few hand tools.

A general industrial course will require a sufficient variety of shop equipment to give the pupils an acquaintance with the main processes in a few of the larger trades. The chief use of shop work, however, will be as a medium for making more effective the instruction in mathematics and mechanical drawing.

Drawing

Drawing is next in importance to mathematics. Every kind of building work begins with a drawing, and throughout every process of construction drawings constitute the common language of the industry. In many trades the workman who is unable to read plans cannot hold a job.

Plan-reading requires more than ability to decipher here and there lines that represent doors, windows, and pipes. The workman must be able to picture to himself just the sort of a door or window, or just what grouping of pipes is called for, and know how to

utilize the exact measurements and locations of the various parts shown in the plan so that when finally placed they will be where the architect intended them to be.

It is doubtful whether much of the drawing in the public schools tends to develop this kind of ability. An idea of the drawing work now given may be obtained from the following section copied from the recently adopted course in drawing and applied art.

Eighth Grade

September, October

Nature Drawing—Pencil holding; practice the character of the line. Draw from flowers and plants, berries and seed-pods. Arrange carefully against a background, showing just enough material for a pleasing study. Place the study within a rectangle and pay special attention to the filling of the space. Draw the study in with a light gray pencil line, the height and width and the direction of the lines. All pencil drawings must show black and white as well as gray to show three values.

Decorative Composition—Make small light gray outline drawings 4 in.–6½ in. to be used later for a calendar. Color these drawings in flat washes in harmonious tones. Outline the entire study with a black line even width throughout.

May, June

Perspective—Tables, chairs, desks. Draw the interior of a room, showing one wall, with an open door and a window. This is a problem in perspective and should be carefully studied.

Colored crayons may be used in this work. Draw buildings; place in a landscape.

Nature Drawing—Flowers and plants in color and pencil. Arrange with an enclosure.

Very few of the boys who are likely to become building workers, or for that matter, very few of those who are likely to enter any industrial occupation, will make any extensive use of free-hand drawing. The sketching of landscapes and lilies cannot be compared from the standpoint of future utility, with practice in making drawings with rule and compass.

At present the junior high school course provides for only one hour a week in mechanical drawing. All of the boys who may be expected to elect an industrial course can well afford to devote more time to this subject. The aim throughout the course should be to teach the pupils to read and interpret drawings rather than to give them preliminary training for drafting.

Elementary Science

Although less directly related to the work than mathematics and drawing, an introductory knowledge of physics and chemistry is needed in many of the building trades, particularly in plumbing, steam-fitting, inside wiring, carpentry, and painting. The plumber and the steam-fitter should know something of the most common chemical reactions, the laws governing the contraction and expansion of gases, water pressure, the physical laws involved in the operation of pumps, and so on. The inside wireman

needs to know the elementary principles of magnetism and electricity; the painter, the theory of chemical combinations and the laws of color; the carpenter, the effects of heat and moisture on various kinds of materials and the laws of mechanics.

It is not suggested that the junior high school should undertake thorough and formal courses in physics and chemistry for boys in the seventh and eighth grades. But the pupil should not leave school without at least knowing that these sciences exist, and that only through them can he obtain an understanding of the laws which govern nearly all industrial processes. Much of this instruction can be given in conjunction with the shop work. To do this will require some additional equipment, mainly for demonstrational and illustrative purposes. The principal mechanical and chemical laws should be explained, as the shop problems present examples of their relation to materials and processes. Educational motion pictures are now available which are of great value as aids in this sort of teaching.

In addition, the pupils should be taught the common technical terms well enough to understand their use in trade handbooks. The time these boys will remain in school is so limited that it is not practicable to cover more than a small proportion of the instruction they will need in order to advance beyond purely routine employment in the trades. After they go to work they can obtain much useful information from trade journals, handbooks, and popular literature, if they have learned in school the use of reference

books and the meaning of the technical terms commonly used by architects and engineers.

Industrial Information

Finally, all boys who expect to leave school at the end of the compulsory period should devote some time to a study of economic and industrial conditions in wage-earning occupations such as hours of labor, regularity of employment, wages, health and accident risks, opportunities for promotion, apprenticeship conditions, and so on. Today most boys stumble into rather than choose vocations, because they possess no accurate or comprehensive knowledge of the advantages and disadvantages presented by different kinds of industrial work. The reports of the present Survey contain the kind of data needed for such a course, but as industrial conditions change rapidly, frequent revision will be needed. This revision can be made by the teachers if they keep in close touch with local sources of information, such as labor unions and employers' associations.

The Technical High Schools

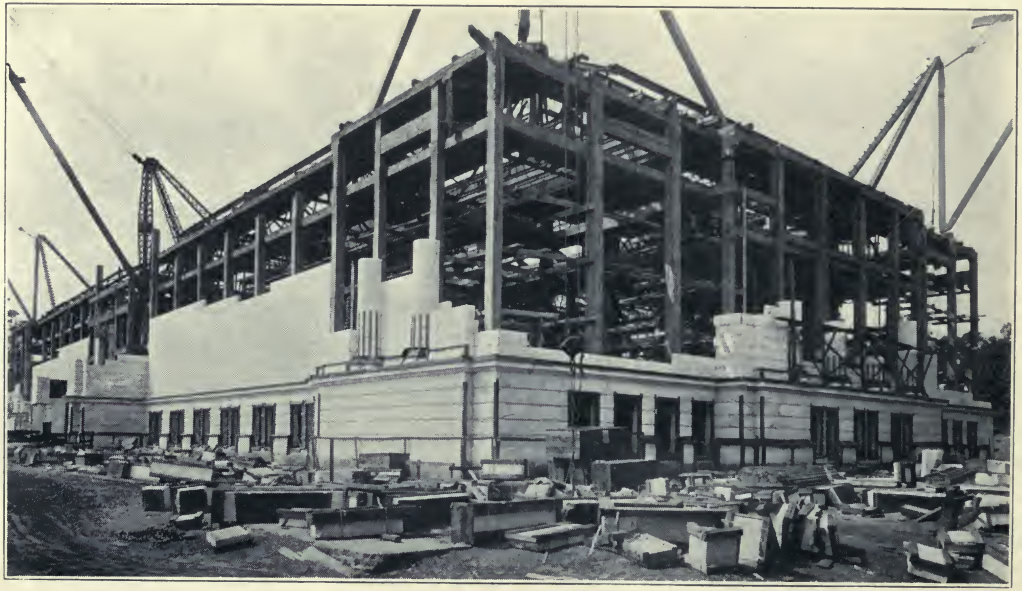
The technical high schools offer excellent theoretical and practical instruction to boys who can afford to spend four years in a high school course. It is a fact, however, that few of the students in these schools become artisans in industry, at least for any length of time. The technical training they receive in school

soon carries them out of the class of manual workers. A recent canvass of the present occupations of graduates from East Technical High School shows that only about two per cent are employed in building trades. About two-fifths are in colleges, and of those at work a large proportion are employed in the drafting and clerical departments of industrial establishments.

The technical high schools give shop work in two of the building trades, cabinet making, and sheet metal work, and courses in mechanical and architectural drawing. During the third and fourth years pupils may elect trade courses. In the first term of 1915–16 there were in the two schools 22 third and fourth year students taking the course in cabinet-making, and 19 taking architectural drawing. As cabinet making is a small trade, recruited almost entirely from foreign labor, it is unlikely that many of the boys now taking this course will become journeymen workmen.

The Need for a Two-Year Vocational Course

The boy who eventually becomes a skilled workman usually leaves school at the end of the compulsory attendance period, that is, when he is about 15 years old. Between this time and the minimum entering age for apprentices in most of the building trades there is a gap of from one to three years which might well be utilized in trade training of a more closely specialized sort than is now given in the technical



Art Museum after fifteen and one-half months' work, September 5, 1914. The marble work is well under way

high schools, where the first and second year courses are in the nature of a preparation for the more advanced work of the third and fourth years. Boys who are going to enter the trades will not attend high school four years, nor do courses of this length hold any large number of them past the end of the second year. For this reason it is the belief of the Survey Staff that some provision should be made for a two-year vocational course, comprising instruction closely related to the principal trades and affording opportunity for specialized work in a variety of industrial occupations. Such a course might be given in the technical high schools, although there is no doubt that a separate trade vocational school would offer fewer administrative difficulties, and provide much better facilities for giving instruction of immediate practical value.

As this matter is fully discussed in the summary volume of the vocational education reports from the viewpoint of the whole industrial trades group, it need not be taken up in further detail here. It has been mentioned to show that between the end of the compulsory period and the entering age in the building trades there is a real need for trade training which cannot be supplied in the junior high school, nor under the present organization, in the technical high school.

Summary

1. Vocational training for boys who will enter the building trades must be started not later than the

seventh grade, because the majority of them are from one to three years behind grade, and therefore reach the end of the compulsory period and leave school before completing the elementary course.

2. It is doubtful whether training at all closely related to these trades can be given in the regular elementary schools, as they are now organized, because the number of boys in the seventh and eighth grades of the average elementary school is too small to permit differentiation of courses.

3. In the junior high school the number of boys old enough to profit by vocational training is sufficient to warrant a general industrial course, although those who are likely to go into any particular trade are not enough to make specialized trade training feasible.

4. The most important subject in an industrial course for these trades is applied mathematics. Every skilled building worker needs, in addition to a thorough knowledge of ordinary arithmetical operations, the ability to apply certain principles of geometry to everyday work.

5. The course of study as now arranged places mensuration and constructional geometry in the last half of the eighth grade. In view of the fact that a majority of the boys who go into building work leave school before the end of the eighth grade, these subjects should be taught earlier in the course and more time should be devoted to them.

6. The shop work now given in the elementary and junior high schools is limited to wood work. A greater

variety of shop activities is needed. The chief vocational use of shop work will be as a medium for making more effective the instruction in mathematics and mechanical drawing.

7. From the standpoint of future utility freehand drawing cannot be compared with mechanical drawing. More time should be devoted to this latter subject.

8. A knowledge of elementary science is needed in many of the building trades. Much valuable instruction in physics and chemistry can be given in conjunction with the shop work, if adequate equipment is provided. Pupils should be taught the common technical terms in these sciences well enough to understand their use in trade handbooks.

9. All boys who expect to leave school at the end of the compulsory period should devote some time in the junior high school to a study of economic and industrial conditions in wage-earning occupations.

10. The technical high schools present excellent theoretical and practical courses for boys who can afford a four year high school course. Very few of the graduates, however, become artisans.

11. Boys who are going to enter the building trades as artisans will not take the four-year technical course. To fill the gap now existing between the end of the compulsory period and the entering age in the trades there is needed a shorter course, not to exceed two years in length, to be given either in the technical high school or in a separate trade vocational school.

CHAPTER V

TRAINING AFTER LEAVING SCHOOL

There have been two great changes in the character and conduct of the building industries during the past third of a century and both of them have resulted in radical changes in the relation between the employer and the apprentice. Not many years ago the employer was himself an artisan workman and he was personally interested in his apprentice, over whom he exercised an almost paternal influence and control. Today the employer is usually not an artisan workman, but a contracting firm often employing hundreds of workers and having an elaborate equipment of offices, yards, trucks, and even mills. The relation of the modern contracting firm toward the apprentice can no longer be of that personal sort that existed between the old-time master-carpenter and his apprentice.

The second great change that has come about in the building industry is the specialization of work that characterizes present-day building operations and on which comment has been made in a previous chapter. This progressive specialization has brought with it new conditions which result in still further

changes in the relation between employer and apprentice. When Perry built the fleet that won the victory in the battle of Lake Erie, the same ship carpenters felled the trees in the forest and carried through each successive operation until they put the final touches on the interior finish of the cabins. They were all-round workmen and they trained their apprentices to be all-round workmen like themselves.

Today the progressive specialization and subdivision of industry has brought with it a kind of extension or stretching-out of the work under which we now find these trades so organized that the most skilled men in them need far more technical training than the old-time artisans, while the least skilled ones need far less training. The working force today is not made up of all-round workmen. It consists of a few superintendents and foremen, a small number of skilled workmen, a large number of what may be termed "average workmen," and a considerable force of common laborers. These common laborers and average workmen are relatively numerous and the real problem faced by the contracting firms is to secure a sufficient number of highly competent men to direct these less competent ones. For this reason employers who take a real interest in apprentices usually have in mind the training of future foremen rather than the training of future journeymen.

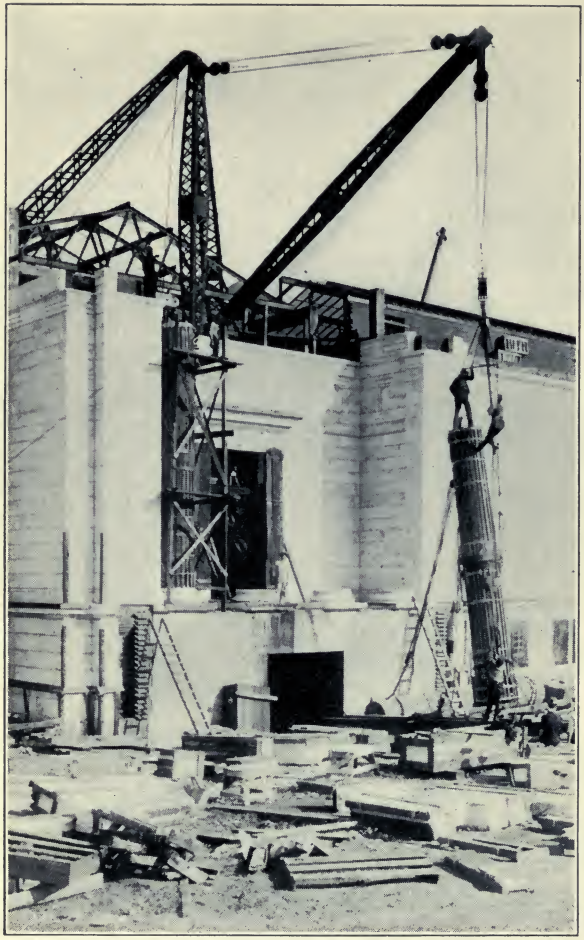
The results of modern changes in the building industry, in so far as they affect apprentices, may be summarized in three statements. In the first place the progressive specialization and subdivision of the

industry have made the apprentice a far less important factor than he was formerly. In the second place the growth of contracting firms has made the relation between apprentice and employer far less personal than it was formerly. In the third place employers who are still interested in the education of apprentices are aiming at the training of foremen and superintendents rather than at developing skilled artisans.

Despite these changed conditions the education of the apprentice in the building trades still constitutes a most important problem. This is largely due to the fact that the building trades are strongly unionized and the unions have decided that entrance into the trades shall be by means of apprenticeship. In some measure the union now takes the place of the old-time employer in the matter of caring for the apprenticeship of the young worker. Under these circumstances the training of the apprentice continues to be important.

Attitude of the Unions

The unions in practically all the trades favor supplementary instruction for apprentices. They believe that only by insisting on a comparatively high standard of technical training for the men entering the trades can effective organization be maintained, and that the training of apprentices represents a means to this end. Several of the trades arrange to have their apprentices attend the technical night schools, and at least one maintains classes for the instruction of beginners.



Art Museum after 17 months' work, October 22, 1914. Placing entrance columns

The Electrical Workers' Union, made up principally of inside wiremen, has paid more attention to training its workers than any other union organization in the building industry. Rooms have been fitted up in the union headquarters where apprentices are given instruction by journeymen in the theory of the trade. The agreement between the Sheet Metal Contractors and the Sheet Metal Workers' Union in Cleveland includes a provision by which the contractors assume for their apprentices the payment of the nominal tuition fee charged by the technical night schools. Attendance is required during the entire apprenticeship period. The agreement between the Plastering Contractors' Association and the Plasterers' Union makes similar provision as to payment of tuition for the instruction of apprentices in architectural drawing during their last year of service. The indenture forms in the bricklayers' trade stipulate that apprentices shall attend the evening technical schools for one year.

Technical Night Schools

The technical night schools offer five building trades courses—sheet metal shop work, sheet metal drafting, electrical construction, cabinet-making, and architectural drawing. In February, 1916, the Survey Staff sent to these schools a questionnaire to be filled out by all the students enrolled. Replies were received from 54 building trades apprentices. These replies showed that 11 of the 54 apprentices were

taking shop courses in their own trades. Two were taking shop courses not related to their own trades. The remaining 41 were taking courses in drawing. These facts indicate the importance of drawing in these trades and they also reflect the common opinion among apprentices that they will not greatly profit by taking shop courses in their own trades in the evening technical schools..

The ages of these apprentices ranged from 16 to 40 years. About 15 per cent were under 18, 40 per cent from 18 to 20, and 45 per cent 20 years old and over. These figures lead to the conclusion that apprentice training for the building trades, contrary to the common belief, has to do mainly with relatively mature workers. So long as attendance is voluntary, this is an advantage. The young man of 20 usually has a keener realization of his educational deficiencies and of the necessity for a thorough grounding in the theory of his trade than has the boy of 16.

The replies also furnished information relating to the length of time the students had attended the school. There are two terms of 10 weeks each in the night school year. Two sessions, of two hours each, are given weekly. This makes a total of 80 hours for the year. A course covering the full apprenticeship period in most of the trades would embrace eight terms, or a total of 320 hours. Only two of the apprentices now enrolled had attended as much as six terms, and only nine as much as four terms. Two-thirds had attended less than three terms. It is certain that the amount of time usually available for

giving supplementary training to these apprentices does not exceed three or four terms, or a total of from 120 to 160 hours. A good deal can be accomplished in this time if it is all devoted to a single subject, as appears to be the case at present. It is far too little, however, to warrant any but highly specialized courses.

The records as to previous education bear out the statements in the preceding chapter with respect to the usual educational equipment of boys who enter industrial occupations. Only one of the 54 had graduated from high school, and only five had remained in school beyond the elementary course. One-third had left school at the end of the seventh grade or before. Four had never attended school in this country, and 18 had received their education in parochial schools.

Only six of the trades were represented, and of these, three furnished but one apprentice each in the shop courses which relate to building work. The sheet metal workers made the best showing, particularly when the size of this trade is taken into account. This is undoubtedly due to the stipulation in the apprenticeship contract by which attendance at night school is made compulsory.

Unless the plan followed by the sheet metal workers' union can be extended to other building trades, the outlook for apprentice training is not hopeful. The fact is that success in any kind of supplementary education for apprentices demands some form of compulsion to hold the boys to the work. Such com-

pulsion can be supplied only by the unions and the employers working in close coöperation with the school. This plan, which appears to be the only one which offers much hope of success at the present time, is beset with difficulties, not the least of which is the indifference of the employers, the unions, and the apprentices themselves.

The night schools stand ready to provide instruction in any technical subject for which a class of reasonable size can be formed. The principals say that in only a few cases have they been able to secure the coöperation of the trade unions in the organization of apprentice classes. Without such coöperation little beyond the results now obtained can be expected. How small these results are may be judged by comparing the present enrollment of 54 building trades apprentices with the total number in the city, which a close estimate places at between 300 and 350. In other words, the ratio of results to needs is about one to six.

Dull Season Classes

There is a dull season of from two to three months each year during which building trades apprentices could attend a day technical or vocational school. This plan has been tried in Chicago, where, by arrangement with the Lane Technical High School, third and fourth year carpenters' apprentices are required by the union to attend the school during the months of January, February, and March. It is prob-

Art Museum after 22 months' work, March 17, 1915. The interior work is well under way

able that similar arrangements could be made in Cleveland. Here again, however, success will depend on the hearty coöperation of unions and employers with the school authorities, as the boys will not go to school regularly unless attendance is made obligatory.

Training for Journeymen and Helpers

The technical night schools make little attempt to differentiate between training for journeymen and training for helpers or apprentices. All three types of workers attend the same classes and receive practically the same instruction.

The investigation made in the technical night schools by the Survey Staff in February, 1916, obtained replies from 157 men and boys employed in building work who were taking night school courses. Full returns were not secured in the West Technical Night School, so the total enrollment is somewhat larger than this number. Of these 157 men, 54 were apprentices, 17 helpers, and 86 journeymen. The distribution of journeymen and helpers among the various trades represented and the number enrolled in each course are shown in Table 15. Two journeymen pipe-fitters are omitted from this table.

Approximately three-fourths of all the men enrolled are taking drawing courses. Both schools possess well-equipped woodworking shops, but only four of the 101 men are taking this shop course. Only 24 are taking shop courses of any kind, and of these 18

are enrolled in a single course—sheet metal work. Only two—a bricklayer and a paperhanger—are enrolled in the mathematics course.

TABLE 15.—DISTRIBUTION OF 101 JOURNEYMEN AND HELPERS IN THE BUILDING TRADES IN THE TECHNICAL NIGHT SCHOOLS, BY TRADES AND COURSES

Workers in trade	Architectural drawing	Mechanical drawing	Cabinet-making	Sheet metal shop	Sheet metal drawing	Mathematics	Courses unrelated to building	Total
Carpenters	35	5	3	..	..	..	..	43
Carpenters' helpers	1	1	..	..	..	..	1	3
Sheet metal workers	..	..	..	13	11	..	1	25
Sheet metal workers' helpers	..	1	..	5	7	..	..	13
Bricklayers	7	..	..	..	..	1	..	8
Bricklayers' helpers	..	1	..	..	..	..	..	1
Paperhangers	1	1	..	..	..	..	..	2
Painters	..	..	1	..	..	1	..	2
Plumbers	1	3	..	..	..	..	..	4
Total	45	12	4	18	18	2	2	101

One-fifth of these men had left school with a sixth grade education, or less, and another fifth stopped at the end of the seventh grade. Only one in seven had received any high school training and only one of the total number enrolled had graduated from high school. Eleven gave no information as to their previous educational training. Approximately one-tenth were educated in parochial schools and nine-tenths in public schools.

The age distribution among helpers taking night school courses differs but little from that among the apprentices. About one-fourth were between 16 and 18 years old, one-fourth between 18 and 20, and one-

half 20 or over. Only five of the 84 journeymen were under 20 years old. Approximately two-thirds were from 20 to 30 years old and nearly one-third 30 and over. How the age distributions in the three groups compare is shown on a percentage basis in Table 16.

TABLE 16.—PERCENTAGE OF APPRENTICES, HELPERS, AND JOURNEYMEN IN BUILDING TRADES ENROLLED IN THE TECHNICAL NIGHT SCHOOLS

Age	Apprentices	Helpers	Journeymen
16 to 18	15	24	..
18 to 20	40	24	6
20 to 30	41	46	65
30 and over	4	6	29

Less than two per cent are enrolled in the mathematics course, a remarkable fact in view of the need for a knowledge of this subject in building work. The teachers attribute the lack of success in shop mathematics courses to the heterogeneous composition of the classes. "We have not had good luck with it," said one. "The class is composed of machinists, electricians, carpenters, and members of several other trades and occupations. The machinists are interested when the problem relates to such things as the strength of steel and iron, but when the teacher begins to talk about board measure they go to sleep." Similarly the carpenters are not interested when the problems relating to machine work are under discussion.

This difficulty is not easy to overcome without greater specialization of the classes than is possible

on the basis of the present enrollment. It is most serious in the mathematics course. In the sheet metal courses the enrollment is made up entirely of journeymen and apprentices from the trade, and in the architectural drawing course those employed in unrelated occupations form only a small part of the class.

Judging by the length of time most of these men attend the school, long courses are not practicable. Only about one in eight of the helpers and about one in seven of the journeymen had attended night school more than one term previous to the present term, and nearly half of the journeymen were enrolled for the first time this term. This means that the average journeyman is unlikely to persevere in night school attendance more than two terms. Many stay only one term.

These facts are of marked significance when considered in their bearing on such matters as the length and content of courses. Journeymen who attend a night school do so as a rule in order to make up some special deficiency in their trade equipment, not for the purpose of obtaining an all-round technical training. Nearly all of them would be benefitted by a course of two or three years. All but a few, however, insist on having their supplementary education in small doses. Apparently the teachers and principals have made a sincere effort to adapt the courses to the demands of the men who attend the school, but the fact is that the difficulties inherent in such work are nearly insuperable because the constantly changing

personnel of the school makes it almost impossible to organize the classes on any basis except that of subject matter, which means fitting students into the courses offered, rather than offering courses fitted to the needs of particular groups of people.

The fact that the school is unable to hold the men more than a term or two is due in part to the lack of flexibility in the organization. Adult workmen go to night school with a definite purpose in mind. In their work they find themselves confronted with some new job with which they are not familiar, or they have difficulty in reading plans, or they find they are unable to lay out certain work properly without a better knowledge of the relations of angles. In nearly every case they want only specific instruction about a specific thing, they want it in the shortest possible time, and very few want exactly the same thing. If the school is so organized that it can furnish only standardized courses, it cannot meet this situation.

In the night school, as in the day school, success in specializing courses requires a large administrative unit. The possible variety of courses is in direct ratio to the number enrolled. In a class of 200 carpenters there would probably be, for example, 10 or 15 men who need specialized instruction in stair-building and a course in this kind of work would be possible, because this number is sufficient to justify the cost of instruction. On the basis of the present enrollment of 40 or 50 carpenters the class would dwindle to

three or four, with the result that the per capita teaching cost becomes so high as to be prohibitive.

The enrollment is far below what should be expected in a city of nearly three-quarters of a million inhabitants. The journeymen workers employed in the building trades in Cleveland number approximately 22,000. The total number of building journeymen, apprentices, and helpers, receiving instruction in trade subjects in the technical night schools is between 150 and 175, or considerably less than one per cent. The apprentices alone should muster a class of at least this size, while the need of supplementary instruction for the men in the trades is great enough to warrant an enrollment of four or five hundred journeymen and helpers.

The relatively small result now obtained is not the fault of the schools, but is due largely to the fact that the great field of evening vocational instruction is treated by the school system as a mere side line of the technical high schools. The evening classes are taught by teachers who have already given their best in the day classes. The enrollment cannot be greatly increased so long as this type of education is handled as one of the marginal activities of the school system, manned by tired teachers and directed by tired principals. It is a totally different kind of job from regular day instruction and requires a different administrative organization, with a responsible head vested with sufficient authority to meet quickly and effectively the widely varying demands of its students. This will require the speed-

ing-up of administrative methods in the establishment of courses and the employment of teachers, a freer hand for the principals as regards both expenditures and policy, and most important of all the organization of all forms of continuation and night school instruction under a separate department.

The night schools in Cleveland, as in most cities in the country, fail to render their full educational return because they are not taken seriously by the educational system and by the community. The universal need of an adaptable, well-organized system for placing the benefits of supplementary education within the reach of every adult member of the community has not yet been recognized. When it is, the work of the evening schools will require a separate organization, to some degree at least a separate teaching force, and a curriculum extensive enough to reach every phase of the industrial life of the city.

Summary

1. Modern conditions have brought about three changes in the conditions of apprenticeship: (a) progressive specialization and subdivision of the industry have made the apprentice a far less important factor than he was formerly; (b) the growth in the size of contracting firms has made the relation between apprentice and employer less direct and personal; (c) employers interested in the education of apprentices aim chiefly at the training of foremen, rather than of journeymen workmen.

2. The unions in practically all the trades favor supplementary instruction for apprentices.

3. The technical night schools offer five building trades courses—sheet metal shop work, sheet metal drafting, electrical construction, cabinet-making, and architectural drawing. About three-fourths of the building trades apprentices in the night schools were taking drawing courses. Only one-fifth were taking shop courses in their own trades.

4. Apprentice training for the building trades has to do mainly with relatively mature workers. Nearly seven-eighths of the apprentices enrolled were 18 years old or over. Nearly one-half were at least 20 years old.

5. The average length of attendance is very short. Two-thirds of these apprentices had attended less than three terms.

6. Only six trades are represented by the apprentices enrolled. Sheet metal workers make the best showing.

7. Some form of compulsion, supplied by the employers, the unions, or both, is necessary to secure the attendance of apprentices in night schools.

8. The number of building trades apprentices enrolled in the technical night schools does not exceed one-sixth of the estimated number in the city.

9. Day classes for apprentices during the dull season might be successful if the hearty coöperation of the employers and unions with the school authorities were secured.

10. The technical night schools make little attempt

to differentiate between training for apprentices and training for journeymen and helpers.

11. About three-fourths of the journeymen and helpers enrolled are taking drawing courses, and about one-fourth shop courses. Less than two per cent were taking courses in mathematics.

12. The teachers attribute the lack of success in shop mathematics to the heterogeneous composition of the classes.

13. Only short courses are practicable, as only a small number of journeymen and helpers attend more than one or two terms. These men need highly specialized instruction, which is possible only with a flexible organization and a large enrollment.

14. Less than one per cent of the building workers in the city are enrolled in the technical night schools at the present time. The relatively insignificant results now obtained are due to the fact that evening vocational instruction is merely one of the marginal activities of the school system, directed by tired principals and taught by tired teachers. When the universal need of such instruction is recognized, it will require a separate organization, a separate teaching force, and a much wider curriculum.

CHAPTER VI

A SUMMARY OF TRAINING RECOMMENDATIONS

The recommendations of this report on education for the building trades may be summarized under five headings.

1. Reduce Retardation

The first, and one of the most important steps in improving the educational preparation of workers entering the building trades, is to reduce retardation or slow progress in the elementary grades. At present it is approximately true of the men entering the building trades that one-third drop out of school by the sixth grade, two-thirds by the seventh grade, and three-thirds by the eighth grade. Now according to law a boy cannot go to work until he is 15, and if he has made normal progress he will have completed the eight grades of the elementary course before he has reached that age. In point of fact many of these boys do not make normal progress through the grades and hence they reach the age of 15 before completing the elementary course. As a result, they fall out of school without having had those portions of the work

in reading, drawing, mathematics, and elementary science which would be of most direct use to them in their future work. These are some of the reasons why the first step in a program to secure better education for workers in the building trades is to reduce retardation throughout the elementary schools.

2. General Industrial Courses in Seventh, Eighth, and Ninth Grades

If retardation could be largely reduced in the elementary grades, industrialized courses could be profitably introduced in the seventh, eighth, and ninth grades for boys intending to enter the building trades. The specific changes recommended include as their most important elements:

a. Increased training in industrial arithmetic beginning in the seventh grade.

b. Courses in industrial drawing.

c. Courses in elementary science relating to industry.

d. Courses in industrial information.

e. General courses in industrial shop work.

These are general industrial courses and it is recommended that they be introduced as prominent features of the work of the junior high schools. They are not intended to take the place of specialized courses in the building trades, but they are proposed as courses valuable for all future industrial workers and within which certain adaptations should be made for those who are intending to enter the build-

ing trades. Special trade preparatory courses will be discussed in the following section.

3. A Two-Year Industrial Trade School

In addition to the general industrial courses in junior high schools that have been recommended in the previous section, there should be established a two-year industrial trade school for boys. It should receive boys 14 to 16 years of age who desire direct trade preparatory training. There are good reasons why the present elementary schools, the proposed junior high schools, and the existing technical high schools cannot satisfactorily take the place of a specialized two-year course in giving boys direct trade preparatory education. Boys who go through the technical high schools do not remain in the building trades as artisans. This is shown by the fact that less than two per cent of the graduates of these schools are working in the building trades.

The elementary schools and the junior high schools cannot conduct satisfactory trade preparatory courses for the building industry for the reason that they do not bring together at any one point a sufficient number of these future workers to make it possible to teach them economically. This is a consideration which conditions every plan for the organization of industrial education. It is a question of the community's capacity to absorb workmen trained for any given occupation. In Cleveland about 4,000 boys leave the public elementary schools each year.

Approximately 2,400 of them drop out of the elementary schools, or leave after graduating from them, while the remaining 1,600 go on to high school. The future workers in the building trades will be largely recruited from the 2,400 boys who leave the elementary schools each year. Most of them range in age from 14 to 16 and in school advancement from the fifth to the eighth grade. They represent a cross-section of a large part of the city's adult manhood of a few years hence.

Now the census figures tell us that if present conditions maintain in the future only about 100 of the 4,000 boys leaving school each year will be carpenters. For the purposes of the present inquiry, we may assume that these 100 future carpenters are to be found among the 2,400 boys who do not go on to high school. But Cleveland has 108 elementary schools and these 100 future carpenters are widely scattered among them. Even if we knew which boys were destined to become carpenters, and even if we knew when they would leave school, and even if we should decide to give them all trade preparatory education for the last two years of their school life, we should still have an average trade class in carpentry of only two boys in each elementary school. This is administratively and educationally impossible. For similar reasons specialized trade preparatory classes in junior high schools would prove exceedingly difficult to organize.

The whole situation is changed, however, when we gather in a central school all these future artisans

who have decided that they wish to prepare for specific trades. Under these conditions classes would be sufficiently large so that specialized training could be given and special equipment provided. This work would best be undertaken in a school entirely devoted to the purpose, but such courses might be organized in connection with the present technical high schools. This arrangement would be less desirable and probably give inferior results. The important point, however, is not so much the organization or curriculum for these classes, it is the fundamental fact that trade classes can be wisely organized only when sufficiently large numbers of pupils can be gathered in one place so as to make the work efficient and economical.

The effectiveness of the trade-preparatory training recommended in this section would be greatly increased if the upper limit of the compulsory attendance period for boys should be placed at 16 years instead of at 15 years, as it is now.

4. Trade Extension Classes for Apprentices

The apprentice in the building trades is a more important factor than in most other trades because these trades are highly unionized and the unions have agreed that entrance to their crafts should be exclusively through apprenticeship. At the present time the technical high schools offer evening classes for apprentices in the building trades. About one-seventh of the apprentices of the city are enrolled in

these classes. In the main they are full-grown men, and in general they do not want shop work related to their own trades but prefer instead to enroll in classes in drawing.

The considerations presented in the previous section bear in minor degree on the problem of providing evening instruction for trade apprentices. The essential for efficient work is that a sufficient number of pupils be brought together so as to make it possible to organize specialized classes in the different kinds of work that the pupils want and need. So long as there are only 50 apprentices enrolled in the entire city, and these represent a number of trades, many different stages of advancement, and a variety of needs, truly efficient work will be impossible. Better conditions can be brought about only through the coöperation of the unions, the employers, and the school people. Employers and unions must not expect the schools to do their best work in this field unless they on their part will compel their apprentices to attend the classes. Similarly the schools cannot expect to get and retain this active coöperation unless they demonstrate that they deserve it by organizing and maintaining apprenticeship classes with courses practical in content and effective in method.

5. Trade Extension Work for Journeymen

The evening technical high schools now maintain shop classes and drawing classes for workers in the

building trades. Less than one per cent of the workers in these trades are enrolled in these classes. There is little differentiation in the school work offered to helpers, apprentices, and journeymen. The result is that the work is much less efficient than it might well be. It cannot be rendered much more efficient than it is until the classes are increased in size, and as a result the work differentiated and specialized. This type of improvement will result only from putting the night school work in the hands of skilful and well-paid directors and teachers who bring to it a degree of energy, enterprise, ingenuity, and adaptability that it is unreasonable to expect and impossible to get from day school teachers who have already given the best that is in them to their regular classes and are giving a fatigued margin of work and attention to their night school pupils.

Evening school classes for journeymen in the building trades must eventually be almost literally prepared to teach "any man any thing at any time." Quite literally they must be prepared to give trade instruction of any sort at any time that it is demanded by a group of workers of reasonable size and sufficient previous experience. The artisan enters the evening class for the specific purpose of securing immediate help out of present difficulties. He wants instructors to tell him and show him what he wants to know. He expects his instructor to know more about his job than he himself knows. He doesnot come to evening school to acquire a general education, but to learn some specific thing. To meet

these requirements efficiently in giving extension education to journeymen in the building trades, the work in the Cleveland evening schools will have to be directed by able people giving their whole time to the work and having a far greater freedom in organizing classes, adopting and changing courses of study, and employing teachers than is now the case.

CLEVELAND EDUCATION SURVEY REPORTS

These reports can be secured from the Survey Committee of the Cleveland Foundation, Cleveland, Ohio. They will be sent postpaid for 25 cents per volume with the exception of "Measuring the Work of the Public Schools" by Judd, "The Cleveland School Survey" by Ayres, and "Wage Earning and Education" by Lutz. These three volumes will be sent for 50 cents each. All of these reports may be secured at the same rates from the Division of Education of the Russell Sage Foundation, New York City.

Child Accounting in the Public Schools—Ayres.
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